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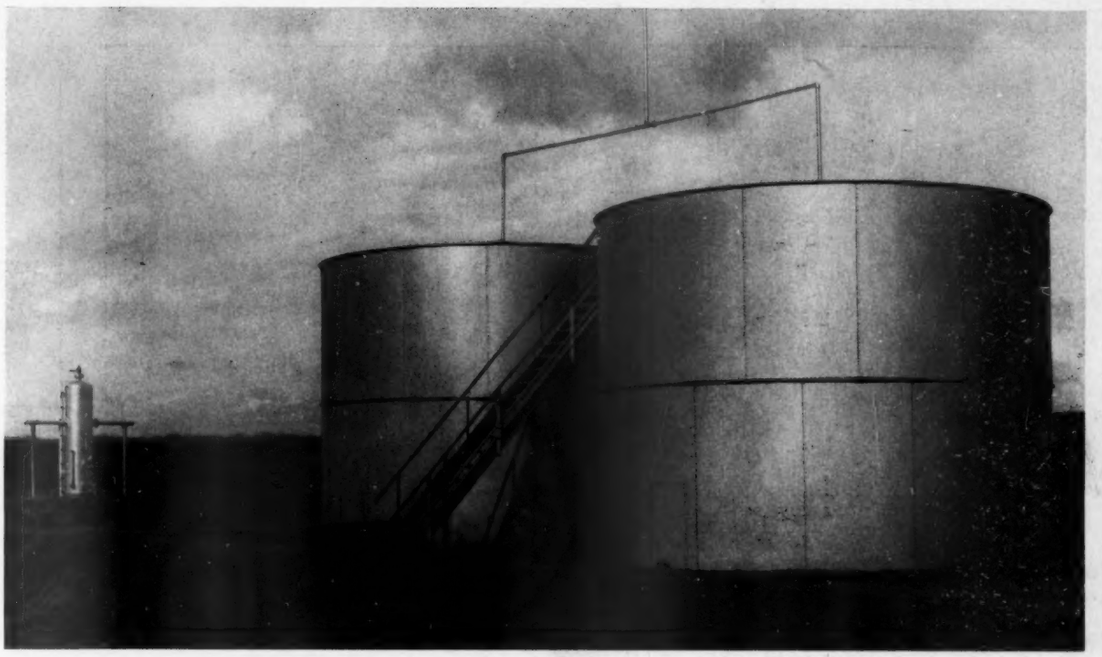

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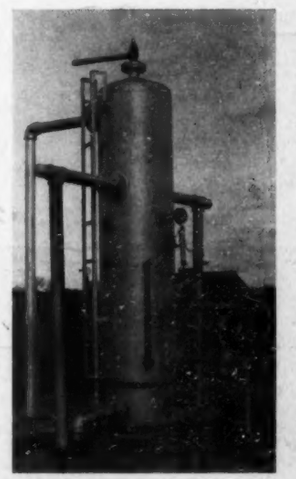

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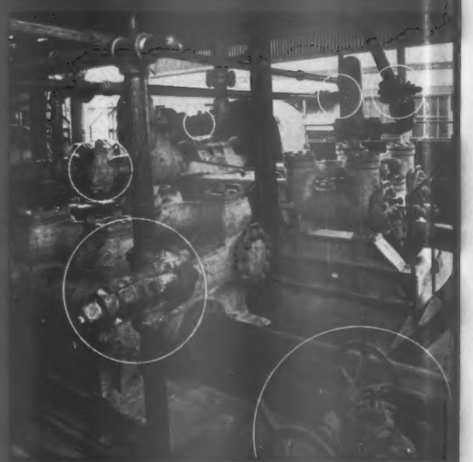

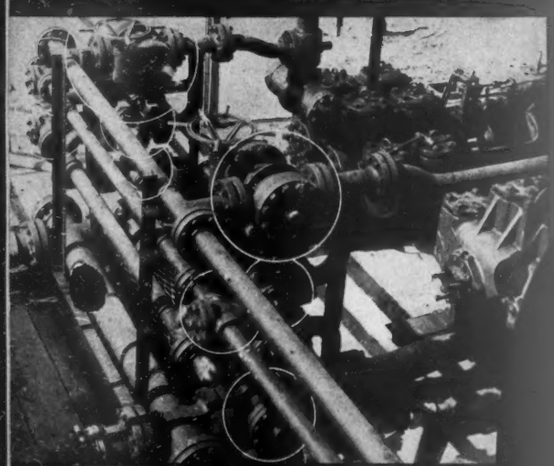

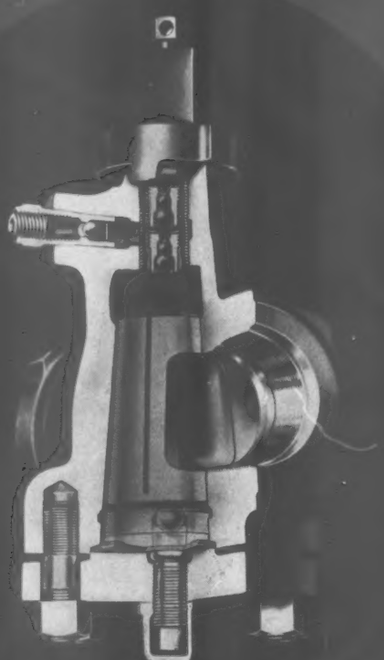

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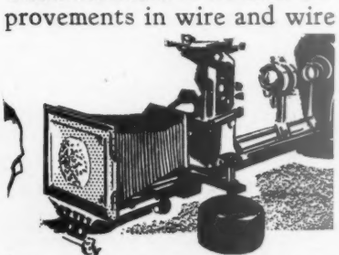

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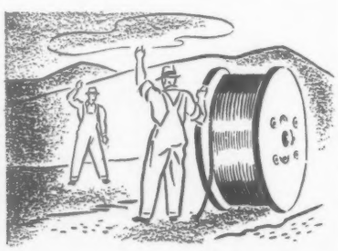

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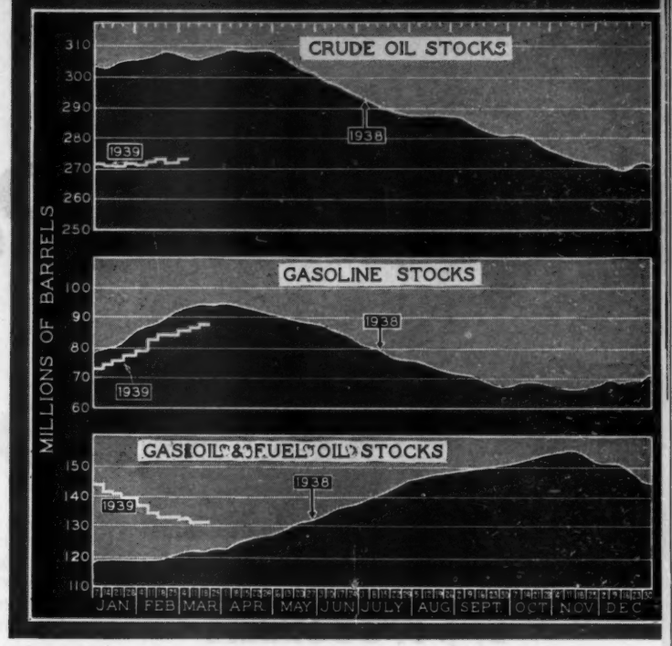
Trends

Industry's Outlook Is Improved by Rational Action in Past Week



THE indications of firmness in the general oil situation in recent days were strengthened further in the past week. Conditions in northeastern Oklahoma stripper fields were made to look better by the action of the Standard Oil Co. of Indiana in relieving the National Refining Co. of surplus oil which the latter company gathers in the Nowata field, which action will maintain the price schedule in that field. The lower house of the Michigan Legislature by an overwhelming vote passed a conservation bill that is rated as one of the best of the state conservation acts yet drawn, and sent it to the senate. The statewide hearing in Austin, Tex., revealed that Texas producers were nearly unanimous in the opinion that production in that state should remain at about its present level during the next 60 to 90 days.

CRUDE PRODUCTION *3,389,868 barrels daily average—up 40,480. One year ago 3,429,572 barrels.*

CRUDE STOCKS *272,971,000 barrels as of March 4—up 1,213,000. One year ago 304,527,000 barrels.*

GASOLINE STOCKS *87,291,000 barrels as of March 18—up 1,325,000. One year ago 92,303,000 barrels.*

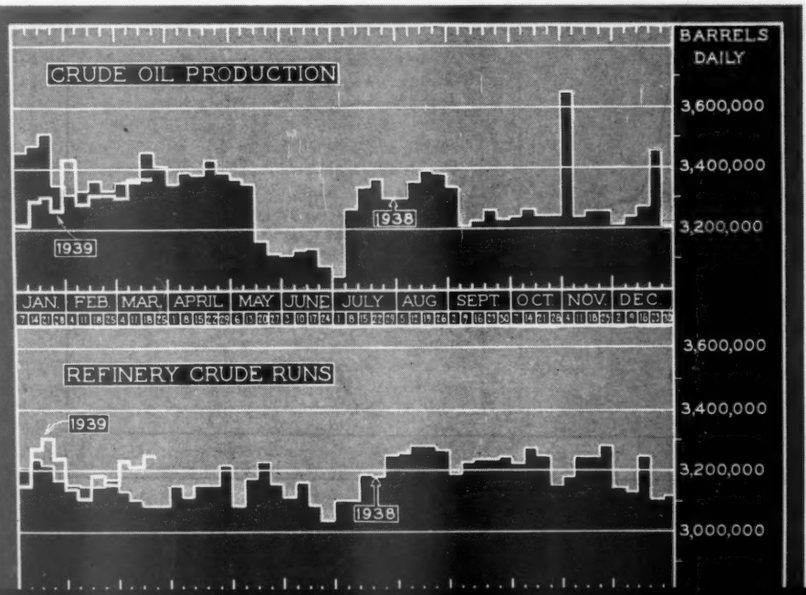
GAS AND FUEL OIL STOCKS *130,371,000 barrels as of March 18—down 275,000. One year ago 121,590,000 barrels.*

REFINERY RUNS *3,250,000 barrels daily week ending March 18—up 45,000. One year ago 3,093,000 barrels.*

The house committee on oil and gas and mining of the Texas legislature indefinitely postponed a hearing scheduled for March 15 on the bill to amend present statutes so as to give the Railroad Commission of Texas control of refining activities.

Last week was one of big wells in widely scattered fields. The Fitts field in Oklahoma came to life with a 2,179-bbl. well. The Hittle pool in Cowley County, Kansas, contributed a better than 7,000-bbl. producer. A Hockley County, West Texas, well flowed 2,048 bbls. in six hours, and a Shackelford County, Central Texas, well started with 4,800 bbls. per day. The largest well yet drilled in Michigan, rated as high as 12,000 bbls. per day, was completed. It is in Clare County. The new Cordes pool in Washington County, Illinois, was given importance by a second well on a structure compared to that from which the Centralia field produces. A McClosky lime pool was opened in McLean County, Kentucky. The Wasco field in Kern County, California, has a new 4,650-bbl. well.

Except for the furnace oils, which are undergoing a seasonal decline, the refinery market exhibits increased firmness. Mounting gasoline stocks, which a few weeks ago were causing much uneasiness, are being viewed with diminishing concern. They are about 7 per cent lower than they were in the corresponding period of 1938, consumption is estimated as 8 per cent higher, and a record-breaking season is in prospect as a result of two world fairs. Also the additions to stocks have dropped in recent weeks. Some of the large refiners are buyers, finding themselves short of their estimated needs for the approaching season. Major refiners have advanced tank-wagon prices at subnormal points in Oklahoma and Texas, contributing substantially to improved sentiment. Large natural gasoline manufacturers are not seeking buyers at the current level of prices, preferring to store for fall demand, and the market continues steady. Lubricating oils continue to gain in the East.



DAILY AVERAGE PRODUCTION FOR WEEK

	Mar. 18, 1939	Bur. Mines Mar. est. of demand	Mar. state allowables	Mar. 11, 1939
Oklahoma City	117,800	.....	.....	115,900
Fitts	30,150	.....	.....	30,200
Remainder of state	298,525	.....	.....	300,175
Total Oklahoma	446,475	473,200	428,000	446,275
East Texas	372,850	.....	.....	372,798
West Texas	210,002	.....	.....	209,352
North Central Texas	111,050	.....	.....	111,296
Texas Panhandle	63,349	.....	.....	65,700
East Central Texas	96,098	.....	.....	94,649
Gulf Coast Texas	358,395	.....	.....	358,048
Southwest Texas	107,950	.....	.....	107,300
Total Texas	1,319,694	1,363,900	1,319,542	1,319,143
North Louisiana	70,430	.....	.....	73,455
Gulf Coast Louisiana	192,596	.....	.....	191,500
Total Louisiana	263,026	259,700	254,220	264,955
California	640,750	588,400	610,000	628,500
Kansas	161,175	150,300	156,850	139,000
Arkansas	53,305	50,000	.....	53,450
Illinois	166,992	125,500	.....	163,100
Eastern fields	98,300	100,300	.....	95,900
Michigan	58,981	47,700	.....	58,495
New Mexico	114,530	109,700	109,700	114,510
Rocky Mountain area	66,640	71,300	.....	66,060
Total United States	3,389,868	3,340,000	.....	3,349,388

Shooting well near Warren, Pa.

Pennsylvania to 15 Years

By J. P. O'DONNELL

Despite the fact that fields in the Pennsylvania Grade region, embracing New York, Pennsylvania, West Virginia, and southeastern Ohio, are the oldest known fields in this country, comparatively little information on their possible productivity and other characteristics was available until recently. These fields in most cases were thoroughly drilled but well records that would have provided invaluable information for future development, particularly by secondary recovery methods, and for estimating their probable economic life, were seldom preserved. This lack of information was remedied several years ago when several of the larger producing companies in the Pennsylvania Grade area combined to make the first thorough survey of the hundreds of fields that make up the area.

From April 1935, to October 1936, a period of 18 months, a corps of geologists and petroleum engineers investigated every field in the region and compiled the first complete, accurate record of producing areas, sands, sand characteristics, wells, repressuring operations and other pertinent data on the entire Pennsylvania Grade area. At the conclusion of the survey, an estimate of the recoverable reserves of the region was made. In 1938, the field data were brought up to date by additional field work, particularly in the water-flood districts, and the reserve estimate recalculated on the basis of this work.

The reserves of the districts producing naturally were calculated entirely by the production-decline curve method of estimating reserves as developed and perfected by the U. S. Bureau of Mines and in the districts where water-flooding prevails, the method was in conjunction with the possible ultimate recoveries per acre according to the performance of flood properties and the many core analyses available. Suitable corrections, based on knowledge obtained from the survey, were made to compensate for districts where air or gas repressuring, water-flooding and proven deeper producing horizons will add to the reserves. This estimate, based on authenticated production records and verified by the exhaustive survey of the entire region, has been made available to The Oil and Gas Journal.

Describing the production-decline curve method for estimating reserves, the survey report states, "The fundamental principle underlying the curve is that the decline of production is, on the average, symmetrical enough to permit projecting the production-decline curve to indicate the estimated production in future years. Any production record will show variations from symmetry because of changes in conditions of operation, new production, use of secondary recovery methods and the numerous economic factors . . .; therefore the longer the record of actual production, the more accurately the curve can be extended and the future production estimated. For this reason it is apparent that this type of curve is readily adaptable to the Pennsylvania Grade area where the age of the fields provides a long interval of production from which to determine the natural decline; the decline showing all the variations from symmetry and being in part a reflection of the economic changes that have taken place. . . . The extension of the production-decline curve allows an estimate of future production based on the average production over the normal decline period.

"The past production figures used in the estimation of reserves for the separate states were taken from the statistical appendix of the Minerals Yearbook issued by the U. S. Bureau of Mines, and those of the Bradford field from figures supplied by the Bradford District Pennsylvania Oil Producers Association."

Based on calculations employing the methods previously explained and the knowledge obtained from the field survey, it is estimated there is now a recoverable total of 440,000,000 bbls. of Pennsylvania Grade crude oil, divided among the region states as follows:

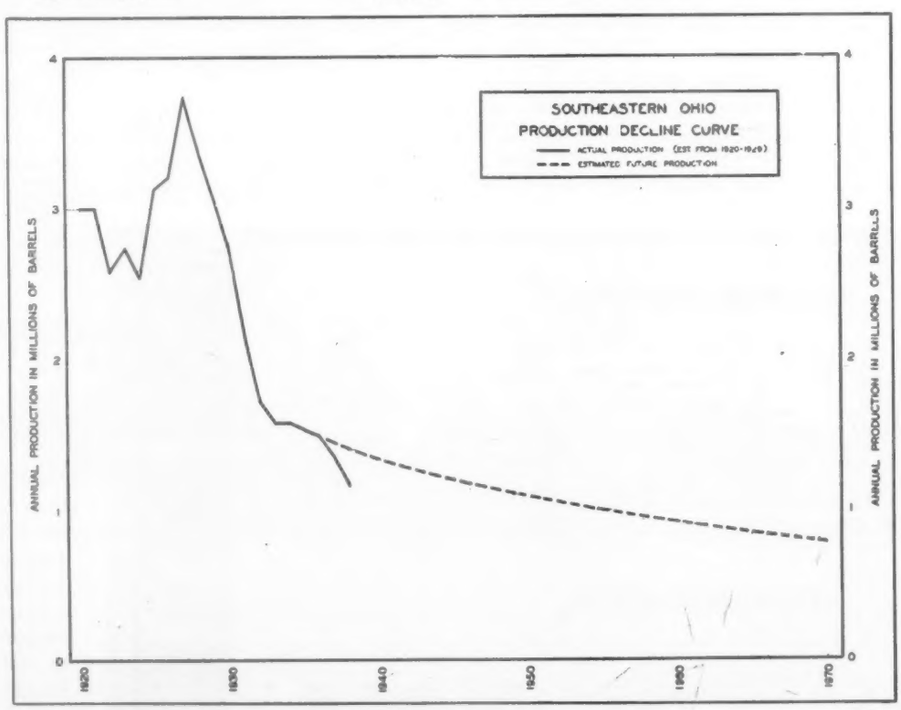
State—	Reserves
New York:	
Natural production	10,000,000
Water-flood production	83,000,000
Pennsylvania:	
Natural production	75,000,000
Water-flood production	137,000,000
West Virginia	100,000,000
Ohio	35,000,000
Pennsylvania Grade region	440,000,000

The above computations are based on the 1936 estimate made by the survey, adjusted and brought up to date by the work done in 1938. Adjustments included the deduction of production in 1937 and 1938 and the addition of reserves from several other areas in the Bradford-Allegany district which in the meantime have been found to be susceptible to water-flooding.

According to the commonly used method of estimating future crude supply on a demand basis, the reserves of the Pennsylvania Grade area have an equivalent life of 15 years or slightly longer than present computations on the life of the national crude reserves.

The accompanying diagrams show graphically the manner in which these conclusions were reached. The graphs for Pennsylvania, New York and West Virginia show the actual production from the peak year and the estimated average rate of decline of the natural production. The peak production for the Pennsylvania Grade district in Ohio cannot be shown because of lack of accurate production figures previous to 1930. The Pennsylvania and New York graphs contain shaded areas which indicate the amount of oil recovered by water-flooding.

In order to determine the reserves of the water-flood areas "quality of acreage" maps were employed. These maps, based on records of flood-



Grade Reserve Equal of Present Demand

ed-out properties and on the numerous cores available, showed the quality of acreage of these fields on the basis of possible ultimate recovery by water-flooding. The sum of the possible ultimate recoveries provided an accurate estimate of the recoverable oil content of the flood areas at the time water-flooding began. By subtracting the calculated natural production from the actual production during the period in which water-flooding has been in effect, it was possible to obtain the amount of oil that had been recovered by flooding. Deduction of that amount from the recoverable content previous to water-flooding provided the total reserve of economically recoverable oil still remaining in the flood areas.

The matter of calculating the reserves for the region and by states was not without difficulty due principally to the reason that production of Pennsylvania Grade crude in Ohio is not segregated from production for the state as a whole previous to 1930. It was further complicated by the problem of dividing the reserves of the Bradford field between the states of Pennsylvania and New York. This division was made according to flood production to date on basis of quality and amount of acreage in each state. While the division of the reserve does not affect the estimate for the region as a whole, it does provide a possible source of error as those two states individually are concerned.

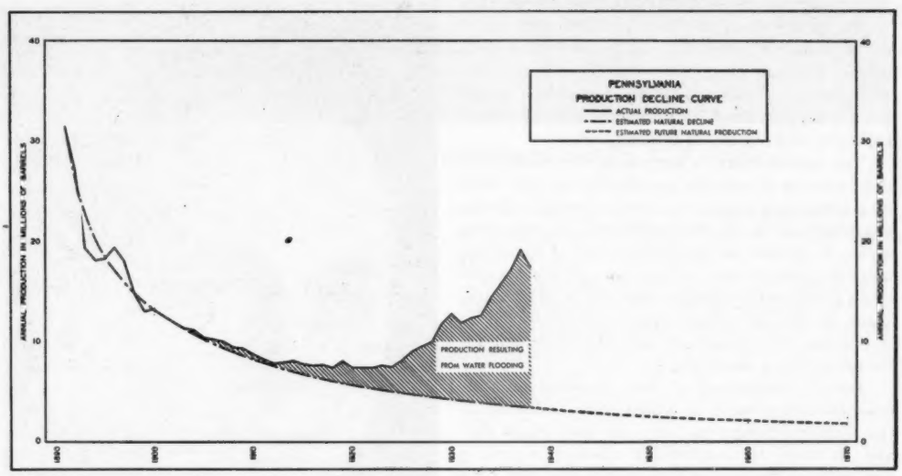
Water-flood production has proven economical mainly in the Bradford field, lying in Pennsylvania and New York, in the Bolivar, Buena Vista, Scio, Browning and Humphrey fields of New York and in the Kanesholm (Burning Well) and Tally Ho fields in Pennsylvania.

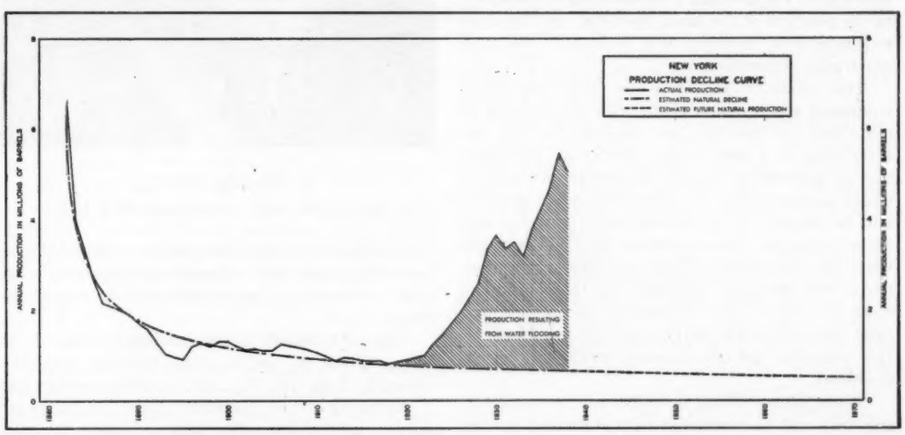
The combined original recoverable oil reserves of these water-flood areas is calculated at 408,250,000 bbls. To date an estimated 188,000,000 bbls., or 46 per cent of the total, has been produced. Accordingly there remains a reserve of 220,000,000 bbls., or 54 per cent of the original reserve, yet to be produced by water-flooding.

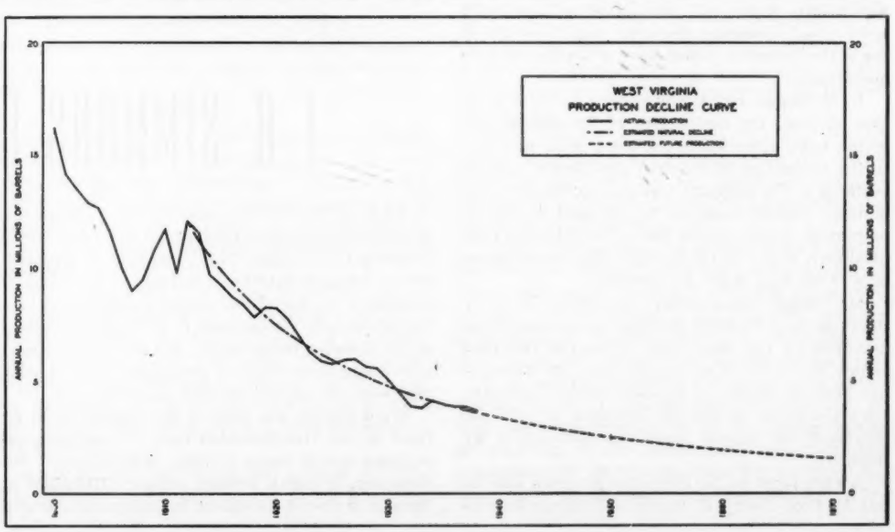
The Bradford field, including the closely adjacent Kanesholm and Tally Ho pools, has a total of 76,600 acres where the possible ultimate recoveries are sufficient to classify the acreage under the economically recoverable oil heading by present water-flooding methods. The recoverable oil content of this area previous to water-flooding is estimated at 305,650,000 bbls. By subtracting the production to date obtained through water-flooding from this recoverable content, it is calculated that a reserve of approximately 152,000,000 bbls. remains in the area.

The water-flood fields of New York, excepting the New York portion of the Bradford field, have a combined total area of 36,000 acres classified under the economically recoverable oil heading. The recoverable content of these fields previous to water-flooding is estimated at 102,600,000 bbls. which leaves a reserve of approximately 68,000,000 bbls. after subtracting the production to date obtained through water-flooding.

(Continued on Page 36)







W.P.R.A. to Enlarge Its Technical and Statistical Activities

By C. O. WILLSON

SAN ANTONIO, Tex., March 21.—The membership of the Western Petroleum Refiners Association which opened its twenty-seventh annual meeting here yesterday, today laid plans to expand the activities of the association which have to do with the collection and dissemination of technical and statistical information.

The action today is the result of considerable discussion as to how the association can best serve its membership among the large and small refining organizations of the Mid-Continent and adjoining areas. It is believed the enlargement of those two activities which have been a part of the association's program for several years will be of practical value to the individual operators and serve to strengthen the position of the Mid-Continent refining industry generally.

Taking cognizance of new developments in manufacturing, some of which were discussed in the technical programs here, the association will aim to keep its membership advised regarding new refinery processing with special attention paid to the position of the small operator. Sectional as well as general meetings will be held by the manufacturing committee.

The program also provides for cooperative studies of specification trend with the thought in mind that the membership, working through the association, can protect their products. The adoption of association grades for certain products is under consideration. It is felt that such a grading will be helpful in the marketing of gasoline and other products. The promotion of Mid-Continent lubricants and asphalts is also of interest to a number of the members who feel that these products have not received the recognition in national and local markets to which they are entitled. Cooperative research and development work will be encouraged.

These efforts along technical and manufacturing lines will be correlated with statistical studies and reports which will keep Mid-Continent refiners advised regarding economic conditions within the entire industry, which have a bearing on their operations.

C. M. Boggs, retiring president of the association, stressed the desirability of the membership giving more attention to the work of its manufacturing committee in his final presidential address yesterday. The program was also approved by resolutions adopted today to be followed by the appointment of committees. Several well known technical men in the Mid-Continent were elected members of the new board of directors.

Mr. Boggs commended the work of A. V. Bourque who recently resigned as secretary and treasurer of the association to accept the presidency of the Petroleum Sales Corp. Mr. Bourque has been in charge of the association's activities since the death of Howard Bennette in 1935 and previously for several years was assistant to Mr. Bennette.

A high point in the three-day program was the talk by Prof. Henry M. Busch of Western Reserve University, Cleveland, Ohio, which covered trends in world political and economic developments with brief reference to their implication to the oil industry.

R. W. McDOWELL
Executive vice president, W.P.R.A.

The contribution of the petroleum industry to the progress of the aviation industry was discussed by Brig. Gen. F. L. Martin of Shreveport, La.

Members of the association were the guests of supply and transportation companies at a Mexican dinner held at the Governor's Palace Monday evening.

"New attitudes toward business and industry are not entirely unfavorable," Victor H. Scales, director of public relations for the American Petroleum Institute, told the membership in a talk on new attitudes. "They seem to demand that such enterprises shall be more than merely profitable; that their operation shall be in the public interest, that essential services of widespread benefit shall be rendered, and that real and substantial contributions shall be made to the national economy. In other words, business and industry are expected to assume new and additional responsibilities, civic as well as economic, and some bordering upon the humanitarian."

In emphasizing the many angles to present day public relations Mr. Scales said oil company management must endeavor to create goodwill among its customers, stockholders, employes, competitors, government officials and among themselves.

"Business and industry spend generously to advertise their products but say little about themselves," Mr. Scales said in outlining the plans of the Institute for aiding in the promotion of improved public relations." Under conditions of the recent past, this was tantamount to spending millions for tribute and not one cent for defense. Those who attack business and industry must be viewed primarily as customers still unsold. It is easy to become disgruntled and angry with these critics. Yet business never seeks to overcome consumer dislike of its products by combative measures. Instead, it endeavors to create consumer understanding and confidence, and to demonstrate to the prospective customer that the purchase will be to his personal benefit. By adapting such methods of the needs of public relations, business and industry should be equally successful in selling themselves."

Mr. Scales explained some of the features of

L. B. SIMMONS ELECTED PRESIDENT

SAN ANTONIO, Tex., Mar. 21.—L. B. Simmons, president and general manager of the Rock Island Refining Co., Duncan, Okla., was elected president of the Western Petroleum Refiners Association at a business session of the annual meeting held here this afternoon. He succeeds C. M. Boggs, president of the Kanotex Refining Co., Arkansas City, Kans., who closed four years as president of the association with his annual address yesterday.

High tribute was paid to Mr. Boggs, oldest refiner in the Mid-Continent field in operating experience which began in 1893. His successor, Mr. Simmons, is also a veteran refiner. His plant at Duncan is one of the oldest in Oklahoma operated by an independent refining company. The company purchases its crude supplies from southern Oklahoma fields and distributes its products over several states. Mr. Simmons is widely known in Mid-Continent refining circles and is active in the civic affairs of his section of the state.

Other officers elected were R. W. McDowell, vice president of the Mid-Continent Petroleum Corp., Tulsa, executive vice president; C. L. Henderson, vice president, Vickers Petroleum Co., Wichita, Kans.; T. M. Martin, vice president, Lion Oil Refining Co., El Dorado, Ark., and C. W. Cahoon, Jr., president, Olney Oil & Refining Co., Wichita Falls, Tex., vice presidents.

SPEAKERS AT W.P.R.A. MEETING: *Fayette B. Dow, Glenn Griswold, Martin Fleischmann and Dr. E. R. Smoley*

the Institute's program which is being directed by a general committee and 13 regional public relations committees. The program is not competitive with any existing public relations work of associations or private companies. It is in the nature of a clearing house for all matters pertaining to public relations. It is anticipated that the department, working through the committees, will conduct studies as to what is being done and future needs and these findings will be made available to the industry generally.

The increasing importance of public relations was also stressed by Glen M. Griswold, Griswold Associates, of New York City, former editor of Business Week and Chicago Journal of Commerce. The oil industry is more vulnerable than any other major industry in its public relations, Mr. Griswold said, pointing out that this was due to the nature of its operations and the fact that it operated with a natural resource in whose conservation the public was directly interested. He urged the industry protect itself by telling its story to the public.

Mr. Griswold predicted an upturn in general business in the immediate future and also contended a European war would mean an expansion in business despite the restrictions that have been placed on the sale of war materials on the extension of credit to debtor nations.

Fayette B. Dow, Washington representative of the association, outlined briefly a report which he had compiled covering the eight addresses made by Thurman Arnold, assistant attorney general in charge of the antitrust division of the Department of Justice, since his appointment to that position a year ago. The report also covers 21 announcements made by the division over that period. The report was prepared as a basis for determining the present and probable future attitude of the Department of Justice in antitrust matters. Copies of the report are available from the association headquarters in Tulsa.

At the technical sessions wide interest was apparent in developments which have to do with the application of catalysis in petroleum refining. This comparatively new tool of the plant operator has made rapid strides and most refiners are considering its possible use in their operations.

The prepared and informal discussions of this subject were largely off-the-record owing to the fact that part of the work is still in the development stage. Wright W. Gary, of the M. W. Kellogg Co., presented a paper on catalysis, octane and economic, on Monday which was followed by considerable discussion.

It was shown that the application of catalysis was spreading rapidly in several directions in the distillation of petroleum products. Each process is distinct in itself and of varying economic attractiveness at this time. The catalytic processes include cracking of gas oils; viscosity-breaking and vaporization of reduced crudes; reforming straightrun gasolines and naphtha; reforming cracked gasolines; and desulfurization, polymerization, alkylation and isomerization. These processes vary as to catalysts used and method of operation but all are now either in the development or actual operating stage.

In regard to the catalysts it was explained that activity characteristics, long life including the property of revivification and economical application, are desirable properties. It was said investigation has shown that the synthetic catalysts are preferred over the natural clay catalysts. In this connection it was revealed that stable aviation gasolines can be produced directly through the use of the proper synthetic catalysts. In regard to the intermittent type or continuous type of operation it was contended that the later has advanages in lower construction and operating costs with higher yields of finished products.

Applications Outlined

The several applications of catalytic processing were outlined. These discussions showed there is considerable flexibility in operation, including the utilization of existing thermal equipment. It is practical, for instance, to thermally crack in existing equipment the gas oils produced by catalysis. However, the optimum yields of the highest octane gasolines are produced through a complete application of catalytic methods.

Exceptional results were obtained in refining charging stocks of high sulfur content. The finished gasoline was within the maximum sulfur specification. The catalytic gasolines are also more susceptible to tetraethyl lead in the blending of high octane motor fuels than thermally cracked gasoline.

In regard to the position of the small refiner it was explained that in the present status of development, catalytic cracking probably is not advisable for units under 5,000 bbls. daily capacity. Investment and operating costs per unit of charge are constantly being lowered and as these costs are reduced their attractiveness to small refiners will increase.

As to the ultimate effect this method of refining will have on gasoline quality it was predicted that the octane rating of premium gasoline will be increased to 85, house brand to 77 and third grade 70.

Catalytic reforming is particularly attractive at this time, regardless of size of unit, according to the data presented which indicated that it afforded an economical method for a refiner to increase the overall rating of motor fuels. Operated with straightrun gasolines and naphthas and cracked gasolines, attractive yields of gasoline were obtained with octane ratings of 90 or above. It was explained that not only is the octane rating high but the gasoline is free of sulfur, low in gum content and acid. Heats were less than 15° F. Boiling range is controlled through the catalysts. Chemical treatment of the finished gasoline was confined to caustic washing.

Highly satisfactory results are also being obtained in catalytic polymerization. It was explained it was practical to operate this type plant with capacities as low as 50 bbls. daily. Substantial yields of isooctane were obtainable in this type of catalytic operation.

Dr. E. R. Smoley, of Lummus Co., described two recently installed combination units at the Smiths Bluff, Tex., refinery of Pure Oil Co. and the Torrance, Calif., refinery of the General Petroleum Corp. The 22,000-bbl. plant of the Pure company was built in 10 months and was accepted following a 47-day continuous operating test. The Torrance plant was built in eight months with a 40-day test run. Both plants incorporate thermal cracking and considerable operating data were presented covering this operating feature. The Pure Oil plant will be described by engineers of that company in the March 30 Annual Refinery Number of The Oil and Gas Journal.

Doctor Smoley explained developments in thermal cracking which will increase yields and octane ratings of gasoline. He also announced developments by his company in catalytic desulfurization and catalytic dehydrogenation.

Martin Fleischmann, a widely known metallurgist of the Timken Roller Bearing Co., explained new developments in steels for oil refinery service. The paper on the action of inhibitors on polymer gasoline by W. B. Ross and L. M. Henderson of Pure Oil Co. will be found on Page 107 of this issue.

F. W. McCurry of Derby Oil Co. presided at the technical meeting Monday and introduced L. B. Mann of Cities Service Oil Co. who spoke briefly as chairman of the association's manufacturing committee. W. M. Carney, Lion Oil Refining Co., presided at the Tuesday technical session.

SPARKS FROM THE NEWS

BETTER LATE THAN NEVER

Refiners have raised tank-wagon prices at subnormal points in Oklahoma and Texas and, according to announced intention, will ignore price-cutters, if any.

DUAL RESPONSIBILITY

Geologists and western refiners held annual meetings this week, the former concerned with finding more oil and the latter with what to do with it after it is found.

LOOKING AHEAD

Some of the recent additions to gasoline stocks are the result, not of excessive runs to stills, but of purchases by refiners who are short of expected requirements for the approaching tourist season.

OKLAHOMA WILDCATS

Three wildcats have been started on the west flank of the old Garber pool in Garfield County, Oklahoma, looking for Wilcox sand production similar to flank development at Oklahoma City and in the Billings field.

OIL CURE

An oil boom cures a lot of ills. Last fall an Evansville, Ind., hotel was worrying about lack of conventions due to a union boycott. It is now worrying about where to put all of the lease brokers.

SHELL PETROLEUM CORP. SURVEY: *Camp boat, work boat, speed boat and barge on Atchafalaya River, Louisiana*

RESURRECTED

Three weeks ago a 6,730-bbl. well was completed in the Hittle pool, Cowley County, Kansas; two weeks ago a 5,233-bbl. well was completed in the pool; last week a 7,161-bbl. well was completed there. And the scoffers once called Cowley County the "graveyard of wildcatters."

TRAVELER'S AID

Ferrying across the Ohio River at Cave-in Rock, Illinois, isn't a very good idea, reports Earl Jukes. There is no road on the Kentucky side and a guide must be secured to lead the traveler out of the wilderness.

RUMOR AND REPORT

Two wells were being drilled in northwest Missouri on the first day of spring, and if rumor and report are based on fact a score of tests will be under way in that state's sector of the Forest City basin by the last day of spring.

MORE OUTLETS

With more wells drilling than in any other single area in Texas reports indicate that the K.M.A. field shortly will have additional pipe line outlets.

ANOTHER AXIS

Speaking of axes—the Russell-Barton-Stafford County axis in Kansas is expected to provide most of wildcat activity in that state this year.

OVERSIGHT

Illinois suggestion to force drilling by taxation overlooks the fact that it would be the quickest way to end the state's revenue from oil.

CHILLY

Congressional attitude towards the National Resources Committee report on oil is suggested by the Senate finance committee's aloofness.

PROGRESS

Still, even if the conferences at Mexico City have so far failed to reach a solution the continuance of negotiations indicates Cardenas admits there is something to negotiate about.

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At the opening A.P.I. session papers by T. A. Hall, First National Bank, Dallas, Tex., (left) and Harold Vance, A. & M. College of Texas, College Station (right) were heard. E. P. Hubbard of Gulf Oil Corp., Houston, newly elected chairman of the Southwest A.P.I. district (center), presided

Condensates and Federal Control are A.P.I. Topics

By D. H. STORMONT

SAN ANTONIO, Tex., Mar. 20.—Distillate wells and recycling gas to recover a maximum of condensate was the main subject of discussion at the spring meeting of the southwest district, Division of Production, of the American Petroleum Institute held here March 16 and 17. The entire afternoon of Friday was devoted to hearing papers on this subject and was generally regarded as the high point of the meeting. Other topics dealt with more general problems of the industry, federal control and proration. Registered attendance was around 400. The 1940 meeting is to be held in Houston around the first of April.

In the morning session on Friday the need for sound laws for conservation of natural resources and fair and intelligent enforcement of these laws by competent state authorities was pointed out by Axtell J. Byles, A.P.I. president, as being necessary in the solution of the industry's problem of over-production. Along with the sound conservation laws he stated there must be a constant revision of these regulations to keep apace with the advance of practices in the industry. Byles recommended four steps which he believed would improve conditions in the industry: (1) Sound conservation laws in each state to prevent waste of natural resources and overstocking of reserve supplies such as now prevailing. (2) Fair and intelligent enforcement of laws by states. (3) Adherence by all states to an interstate compact. (4) That the industry ask Congress to adopt regulations to protect the buying public.

Stressing that the A.P.I. is strongly opposed to federal control of the oil industry, Byles pointed out that the organization is supporting renewal of the Connally hot oil act and a renewal by Congress for another two years of the interstate oil compact.

Extreme caution in developing oil production programs was urged by George A. Hill, Jr., president of the Houston Oil Co. of Houston, Tex., in his discussion of "Proration and Competition." In his presentation of this subject he stated:

"Conservation and proration laws in and of themselves constitute certain fair rules that must be observed by those engaged competitively in the oil business, to protect the paramount public interest in the conservation of irreplaceable natural resources. Such rules, while established by law, have in a large measure the support and approval of those so competitively occupied. The delimitations of the area in which competition is unrestricted are fixed by governmental authority, and not by conspiracy between competitors, and hence are not in derogation of the principles of free and fair competition within the fields of reasonable competitive activity in line with a healthy and sound public policy. From the various brands or types of competition, *fair* competition should have objectives compatible with the protection of the legitimate public interest in proration."

Speaking on the subject of "The Gasoline Tax Situation in Texas," Datus E. Proper of San Antonio, executive vice president of the Texas Good Roads Association, declared the theory that motor vehicles should pay the entire cost of the state highway system was becoming widely accepted. Greater highway safety, he said, can be brought about through three things; engineering, enforcement and education.

The three papers read at the Friday afternoon session on condensates appear in this issue of The Oil and Gas Journal: "Condensate Wells—Completion and Recycling Operations," by P. C. Dixon and E. V. Foran of Parker, Foran, Knode & Boatright, Austin, Tex., on Page 82; "Recovery of Condensate From Distillate Wells," by Emby Kaye of the Tide Water-Seaboard oil companies, Tulsa, on Page 86; and "Laboratory Technique and Equipment for the Study of Condensate," by W. F. Fulton of Union Producing Co., Houston, Tex., on Page 104. Other papers read at the meeting which are also published in full in this issue are "Oil Development and Production Practices in Southwest Texas," by C. H. Row of the Sun Oil Co., Dallas, and R. H. McLemore of the same company, Houston, appearing on Page 89; and "Well Completion Data," by S. F. Bowlby of Shell Petroleum Corp., Houston, on Page 98.

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five papers delivered before the spring meeting of the A.P.I. Division of Production, southwestern district, are published in their entirety.

Authors of papers for the Friday session and A.P.I. officials: Emby Kaye, Tide Water Associated Oil Co., Tulsa; Carl Young, secretary Production Division, A.P.I.; George Corliss, Humble Oil & Refining Co., Houston; P. D. Torrey, Sloan & Zook Co., Houston; W. S. Morris, chairman, East Texas Engineering Association and retiring district chairman, Kilgore; E. P. Hubbard, Gulf Oil Corp., Houston; A. G. Levy, Fohs Oil Co., Houston; J. E. Warren, Carl B. King Drilling Co., Dallas; R. H. McLemore, Sun Oil Co., Dallas, and R. B. Maples, A.P.I., Dallas

Report of the nominating committee was made by A. G. Levy, Fohs Oil Co., Houston, at the Friday morning session. New officers nominated and unanimously elected for the southwest A.P.I. district were: Chairman, E. P. Hubbard of Gulf Oil Corp., Houston; vice chairmen, R. L. Carruthers of Sun Oil Co., Beaumont, for the Gulf Coast; Harold Decker of Seaboard Oil Co., Corpus Christi, for Southwest Texas; L. A. Ogden, Pure Oil Co., Fort Worth, for North and West Texas; T. W. Johnson of Union Producing Co., Shreveport, La., for North Louisiana and Arkansas; C. G. Staley, Lea County proration officer, for New Mexico; J. P. Straight of Cities Service Oil Co., Gladewater, for East Texas. J. U. Teague, Humble Oil &

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Riverside Field Hangs in Balance

By NEIL WILLIAMS

CORPUS CHRISTI, Tex., Mar. 20.—Fate of the new Riverside field, 30 miles northwest of Corpus Christi, in northwestern Nueces County, is hanging in the balance as one of South Texas' most freakish development programs reaches a climax. With barely two months passed since the discovery gas well was brought in, and within four weeks from the completion of the first oil well, five additional tests, started in a flurry of drilling, have been put down to the producing horizons established by the discovery wells.

Contrary to the natural order of events in which development usually is not started until after the completion of the discovery well, this area holds the distinction of having had four tests drilling simultaneously, all within a radius of a mile, before even so much as a barrel of oil had been taken from the ground. Since, two additional tests have been started, which with the four tests (including the oil discovery well), the discovery gas well, and a crater test previously drilled, make a total of eight tests drilled since November.

Uncertainty Prevails

So far the results of the tests, except the discovery wells, have not been up to expectations, and a blanket of uncertainty has been thrown over the area, which at the beginning was generally accepted as being a field of promising potentialities. Three tests, including the south offset to the discovery well already have been abandoned, finding salt water in the sand. The other two although also finding salt water, are drilling deeper in exploration of lower sands.

That a field of fairly large proportions is located in this area was the general conception, on the strength of which the various tests were started in advance of finding oil. So strong was this belief that talk already had started of a pipe-line outlet and the erection of a recycling and gasoline plant. With a good geophysical picture to back it up, the area was looked upon as one of the major discoveries of the past year.

Development of a South Texas field usually is not complete without a good blowout and crater. In this case, development was initiated with such a catastrophe, which, because of the showing of high-pressure gas, gave impetus to the favorable conceptions at that time of the field's potentialities. The blowout occurred last November in Seaboard Oil Corp. No. 1 Ellen C. Wilson, which was drilled almost simultaneously with Stanolind Oil & Gas Co. No. 1 George Clark, the discovery gas well.

Blowing-out with total depth at 6,541 feet, the Seaboard well caught fire, and cratered, swallowing the entire rig and derrick. Fortunately for the operators and the field, the well, with hole evidently bridged, ceased its rampage after a couple of weeks, although the crater still is boiling, one of the largest and deepest craters in South Texas.

The Stanolind discovery gas well is about 3,000 feet southeast of the blowout. Drilled to a total depth of 7,015 feet, it was plugged back to 4,933 feet with 7-inch casing at 5,000 feet, and completed by perforation of casing into sand at 4,888-93 feet. Completed the middle of December, it had a pressure of 1,825 pounds flowing through a three-sixteenths inch choke.

First Oil Well's Production

First oil production was opened by Seaboard Oil Corp. No. 2 Ellen C. Willson, 4,600 feet west of the cratered well. It was completed about February 9, flowing 172 bbls. of oil on a 30-hour gauge through an eighth-inch choke with 1,750 pounds pressure on tubing and 2,100 pounds on casing. Production was from Frio sand with 7-inch casing, cemented at a total depth of 5,037 feet, perforated at 4,994-97½ feet.

Republic Natural Gas Co. No. 1 Seaboard, 6,500 feet southeast of the Seaboard producer, drilling of which started before completion of the latter well, found salt water in the producing horizon, encountered low, and drilled to a total depth of 5,525 feet. Salt water also was tested at two other levels passed up, and the hole was abandoned.

Heep Oil Corp. and Southwestern Corp. No. 1 Seaboard, 2,000 feet southeast of the Republic test, and about 8,000 feet south of the Seaboard well, got salt water in a series of tests from 5,031 to 5,047 feet, with 7-inch casing cemented on bottom at 5,050 feet and perforated at the respective levels. It now is drilling deeper in exploration of lower horizons.

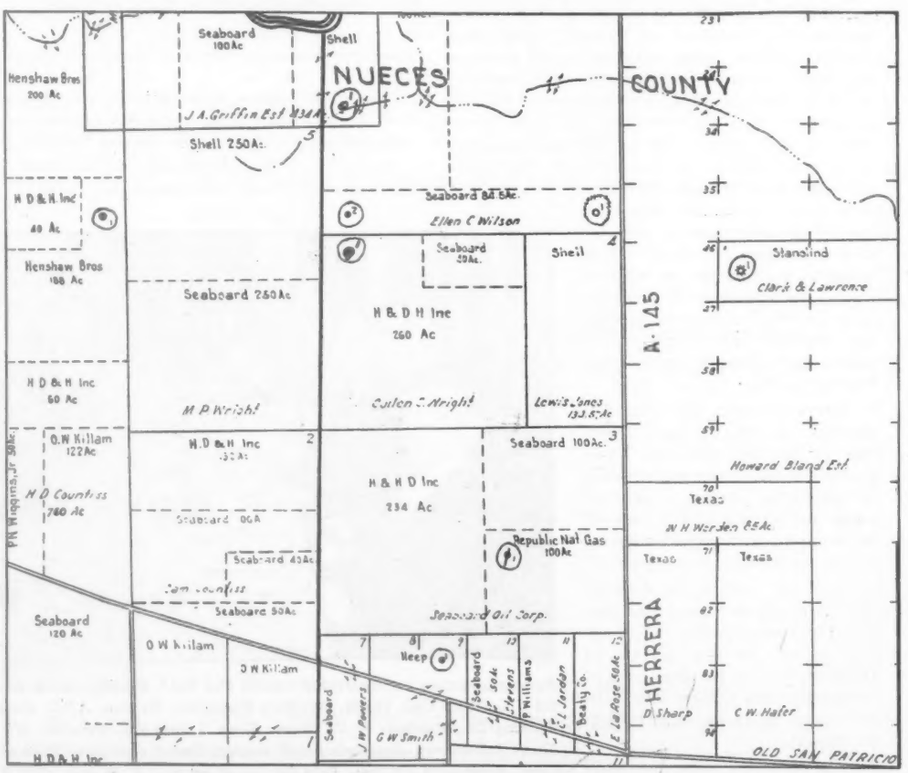
Offset Shows Salt Water

H. D. & H., Inc., No. 1 Wright, a south offset to the oil discovery well, is waiting orders after testing 1,000 feet of salt water in a drill stem test in the producing horizon at 5,018-29 feet.

Henshaw Brothers No. 1 Countiss, 5,200 feet due west of the Seaboard oil discovery, found salt water in the discovery sand, drilled to 5,525 feet and was abandoned.

Shell Petroleum Corp. No. 1 Griffin, 1,650 feet north of the discovery, also found salt water in the sand but is drilling deeper.

All this development has been to the south, west and north of the discovery well. This leaves the way open for further exploration in other directions, and particularly on the opposite sides of the original gas area indicated by the blowout and the gas discovery well, both of which are some distance to the east. While development to date has been disappointing, especially in view of the high expectations originally held, the field still may not be through. Sand multiplicity in the area makes possible the development of other horizons at other locations.



Riverside field, Nueces County, Southwest Texas

Texas Commission Is Advised to Hold Production Level

By D. H. STORMONT

AUSTIN, Tex.—Testimony brought out at the statewide proration hearing held here last week revealed Texas operators were almost unanimous in the opinion daily production for the state should be held at about its present level for the next 60 to 90 days. Many were unconcerned as to whether this was accomplished through maintenance of the two-day shutdowns, or by restoring Saturday production and making adjustments in certain field allowables. That was for the Railroad Commission to decide. But, to lift the two-day shutdowns, or even the Saturday holiday without making any adjustment to hold the top allowable to its present level, they felt would result in undoing much of the progress made during recent months. Current demand would be unable to absorb the additional production.

The testimony presented may result in the commission issuing another three-month order, for April, May and June, retaining the two-day shutdowns. However, many observers felt a 60-day order would more likely be issued in way of compromise. In any event it seems the precedent set at the December hearing, in regard to orders covering more than one month, will be followed. The commission, of course, can call hearings for adjusting the top allowable if it later finds market demand to be in excess of the daily allowable, but by issuing the extended orders crude oil purchasers have a much better knowledge of production levels over the immediate future.

In questioning most of those appearing, the commission attempted to "feel out" their opinions on the subject of Texas statutes being amended to give the Railroad Commission authority to regulate refining activities, especially when carried on in excess of consumer demand. Majority of those questioned felt that this was not necessary as the same result could be accomplished by holding crude production well within consumer demand. Others, however, felt a moderate amount of

Roy B. Jones, Panhandle Refining Co., and Fred Van Covern, of A.P.I.

control over refining activities would not be detrimental but would act to stabilize the whole industry.

Imports of crude from Venezuela and from Louisiana also occupied much attention at the hearing. Representatives of companies testifying were questioned either by commission members or from the floor regarding the amounts they were bringing into the United States and into Texas from Louisiana. The commission, it appeared, was attempting to determine the approximate amount of crude the various companies produced or bought in Louisiana and then transported into Texas for refining and marketing. Knowing these amounts, the commission would then be in a position to ask the companies why this crude was not purchased or produced in Texas where fields producing crudes of like quality and much closer to their refineries are in need of additional markets. Commissioner Sadler read into the record that during January, 1939, total crude imports into Texas were 9,969,617 bbls., of which 4,161858 bbls. came from Louisiana.

Petroleum economists testifying before the commission differed but little in their forecasts of gasoline demand in the next six months, and in regard to the level at which crude production should be held until the season of heavy gasoline consumption begins. Fred Van Covern, director of statistics for the American Petroleum Institute, stated gasoline inventories totaling 80,000,000 to 82,000,000 bbls. at the beginning of this year's motoring season were desirable and that the industry should set as its goal the cutting of gasoline stocks to around 61,000,000 bbls. by September 30. Since gasoline stocks are expected to total around 88,000,000 bbls. by March 31, this would necessitate a reduction of 27,000,000 bbls. during the summer months, he said. In his opinion there "was nothing in the cards" to show the necessity for increasing production for the next 60 to 90 days. He forecast a small increase in demand over the next quarter,

STOCKS OF CRUDE OIL AND GASOLINE (IN BARRELS) AS REPORTED AT THE MARCH STATEWIDE HEARING

Company—	A	1	2	3	4	5	6	7	8	9	10	11
Atlantic Ref. Co.	1,770,000	1,697,000	—43,000	+42,000	4,764,000	+1,238,000	None	2,200,000	7,121,000	1,911,000	4,975,000	Inc. crude 500,000
Barnsdall Oil Corp.	.....	.....	.....	.....	439,000	+116,000	—100,000	.....	1,037,000	.....	325,000	.....
Barnsdall Ref. Co.	.....	236,000	+3,000	+36,000	177,000	—11,000	None	244,000	.....	143,000	177,000	Gaso. —167,000 Crude —177,000
Cities Service Oil Co.	.....	1,753,000	—647,000	—154,000	7,712,000	—362,000	Reduce	2,609,000	12,101,000	1,850,000	7,500,000	.....
Continental Oil Co.	866,000	1,964,000	+262,000	+390,000	8,665,000	—433,000	None	1,701,000	9,098,000	1,935,000	8,714,000	No change
Eastern States Pet. Corp.	160,000	317,000	+90,000	+158,000	165,000	—167,000	.....	108,000	148,000	100,000	50,000	Will reduce
Gulf Oil Corp.	.....	*5,141,000	+797,000	—324,000	*14,250,000	—383,000	..	6,095,000	16,862,000	5,523,000	.....	Slight reductions
Humble Oil & Ref. Co.	2,000,000	1,994,000	—1,076,000	—164,000	12,030,000	—729,000	—191,000	2,278,000	13,166,000	1,907,000	12,055,000	Gaso. —200,000 Crude —191,000
Magnolia Pet. Co.	1,300,000 to 1,400,000	857,000	—1,331,000	+162,000	20,600,000	—1,600,000	(‡)	2,424,000	25,500,000	735,000	19,800,000	Will reduce
Ohio Oil Co.	.....	534,000	+40,000	+132,000	10,464,000	—422,000	None	539,000	10,809,000	542,000	10,464,000	Gaso. 50,000
Pan American P. & T. Co.	.....	2,850,000	+860,000	+600,000	2,940,000	—93,000	.....	2,104,000	3,065,000	2,800,000	2,970,000	Reduce gaso. slightly
Pure Oil Co.	.....	2,159,000	—456,000	+528,000	3,671,000	—36,000	70,000 to 100,000	2,401,000	4,034,000	2,291,000	3,600,000	Gaso. +90,000 Crude —70,000
Republic Oil Ref. Co.	500,000	660,000	+298,000	+134,000	1,007,000	+280,000	Reduce	453,000	949,000	650,000	995,000	.....
Shell Pet. Corp.	5,535,000	5,265,000	—631,000	+526,000	6,586,000	+848,000	+100,000	6,052,000	10,000,000	5,634,000	6,800,000	Crude —100,000 Gaso. +400,000
Skelly Oil Co.	.....	759,000	—5,000	—242,000	607,000	+16,000	Reduce	731,000	739,000	750,000	620,000	Moderate withdrawals
Socony-Vacuum Oil Co.	7,900,000	6,356,000	—1,986,000	+903,000	25,500,000	—1,859,000	.....	8,777,000	31,581,000	7,031,000	24,376,000	Crude —1,765,000 Gaso. +701,000
Standard Oil Co. (Indiana)	.....	5,885,000	—778,000	+942,000	36,586,000	—1,541,000	—828,000	6,493,000	17,452,000	5,544,000	15,123,000	Reduce 828,000
Standard Oil Co. of N. J.	.....	4,775,000	—1,367,000	—359,000	15,793,000	—753,000	—800,000	6,298,000	44,462,000	5,841,000	36,190,000	Moderate cut in gaso.
Sun Oil Co.	.....	†2,987,000	+58,000	+508,000	†5,992,000	—295,000	+159,000	3,168,000	5,562,000	3,043,000	6,027,000	Crude +70,000
Taylor Ref. Co.	.....	278,000	+257,000	+7,000	253,000	+100,000	.....	18,000	32,000	250,000	200,000	Reduce storage
Texas Co.	8,455,000	†8,133,000	—714,000	+1,965,000	†25,984,000	+1,364,000	.....	9,222,000	24,546,000	8,111,000	26,717,000	Crude same Gaso. —78,100
Tide Water Associated Oil	1,400,000	1,478,000	—23,000	+366,000	4,587,000	+17,000	None	§1,521,000	5,028,000	§1,521,000	4,808,000	Not exceed present

A. Gasoline inventories expected on March 31 as reported at the December 12, 1938, statewide hearing.
1. Present stocks of gasoline in all forms, finished and unfinished.
2. Difference between present gasoline stocks and those of a year ago.
3. Change in gasoline stocks since December 1, 1938.
4. Present crude inventory.
5. Change in crude stocks since December 1, 1938.
6. Expected change in crude stocks between now and May 1, 1939.
7. Gasoline stocks as of March 31, 1938.
8. Crude stocks as of March 31, 1938.
9. Expected gasoline inventory on March 31, 1939.
10. Expected crude inventory on March 31, 1939.
11. Policy with reference to inventories from now until May 31, 1939.

*As of February 25, 1939. †As of March 1, 1939.
‡Crude —1,400,000; gaso. —211,000.
§Eastern.

approximating 3,355,000 bbls. daily during April and May.

Dr. Joseph E. Pogue, vice president and economist of the Chase National Bank, New York, forecast an increase in demand for all oils of 6.2 per cent in 1939 as compared with 1938. Crude oil demand for 1939 is placed at 3,440,000 bbls. daily as compared with 3,324,000 bbls. in 1938. This smaller demand in crude he said was due to the carry over in stocks of all oils; in 1937 stocks of all oils having been raised by 47,000,000 bbls. of which only 9,000,000 were withdrawn in 1938. Regarding crude runs and present gasoline stocks he stated that around 4,000,000 bbls. too much gasoline had been made in this first quarter, which would have to be taken into consideration in setting runs during the next three months.

Third economist testifying was Dr. Alexander Sachs of the Lehman Foundation, New York, who predicted a sustained continuance of present conditions. The industry's troubles, he felt, were largely due to the "carry forward" in activities in the fall of 1937 when its markets began to decline in accordance with general business conditions. He predicted a moderate increase in consumer demand over the next six months.

Strong plea for continuance of present production levels as well as retaining the two-day shutdowns was made by Charles F. Roeser, of Fort Worth, president of the I.P.A.A. He declared the consumer market could not stand the lifting of the shutins as there was simply too much oil being produced on a nation-wide basis. Unfavorable conditions existing in various fields, such as pipe line proration and posting of different prices, were pointed as reasons why production should be held in line at this time. He advocated the commission issuing a 90-day order continuing the shutdowns, later adjusting production to conform with market demand if it was found out that the state was under producing.

Among others advocating that production be held at its present level for the next 60 to 90 days were: George A. Hill, Jr., president of Houston Oil Co. of Texas, Houston; Jake Hamon of Cox & Hamon, Dallas, and president of the Stripper Well Association. Among those asking that the shutdowns be lifted were state Senator Joe Hill of Henderson and F. W. Fischer, attorney of Tyler, Tex., who asked that allowables between fields be adjusted and if possible the shutdown lifted. Senator Hill pointed out that the East Texas field was producing only 1 per cent of its hourly potential and had lost considerable of its markets.

Company Testimony

Time was taken for only three of the company officials to testify regarding their crude and gasoline stocks. Practically all those companies invited, however, had prepared answers to the eleven questions the commission has asked for. A summary of these answers is shown in the accompanying table. In addition to these questions the company representatives were asked: (1) What do you think the industry's minimum economic requirements are on September 30, 1939? (2) What are your own minimum requirements on September 30, 1939? (3) Do you not believe there would be economic waste if gasoline inventories are higher than economic requirements? (4) Have you thought of probable economic conditions facing this and other industries over the next few months? (5) In your opinion will there be an increase in the economic demand during 1939, and if so, how much? (6) Will your summer's operating schedule be directed toward achieving your minimum economic working level on September 30, 1939? Those companies not answering this question at the hearing were asked to do so before the first of April.

In connection with the table, it may be of interest to note that the nine companies filing reports at both hearings will probably closely approximate the March 31 level of gasoline stocks as set at the December hearing. The total gasoline inventory of these companies as reported at the hearing is 27,243,000 bbls., whereas at the December hearing the total of the levels set for March 31, 1939, was 28,486,000 bbls. Also of interest is the fact that the companies making reports to the commission represented the holders of over 50 per cent of the nation's gasoline stocks. Other companies who filed at the December hearing but did not at the March hearing, swell this to approximately 65 per cent.

Committee on Standards Urged for Compact

AUSTIN, Tex., Mar. 18.—The Interstate Oil Compact Commission in its quarterly meeting created a technical committee to draft production and conservation standards to be administered within the frame work of state sovereignty. The committee, formed primarily to combat any attempted federal control, will be headed by Commission Chairman E. O. Thompson. The present compact embraces some of the minimum standards and the action taken toward formulating further standards is to meet all the objectives of attempted federal interference. Committee members will be named and technical assistance chosen prior to the compact holding its next quarterly meeting at Santa Fe, N. Mex., about June 12-13.

Motion to create the committee on standards was made by Hiram M. Dow, New Mexico representative, and seconded by W. M. Downing, Colorado representative. In addition to the above, the following compacting states' representatives and official observers for the noncompacting states were present: Illinois, E. J. Cagle and A. H. Bell; Kansas, T. A. Morgan and A. F. Schoeppel; Oklahoma, Charles L. Orr and Commission Secretary Art Walker; Michigan, W. H. Palmer; Louisiana, M. Dunbar and W. H. McFadden; California, E. W. Pauley; Arkansas, J. E. Bailey and Pennsylvania, Parker L. Nelson. At the first day of the compact meeting members sat in with the Railroad Commission at its statewide proration hearing.

Dr. Alfred G. White, chief of the petroleum economics division of the Bureau of Mines, Washington, D. C., informed the commission a 5½ to 6 per cent increase in national consumption of gasoline, as compared with the same period last year, is in prospect for the second quarter of this year. The bureau's forecast of market demand for crude oil in April, he said, would approximate 3,430,000 bbls. Improved business conditions and favorable weather during January increased domestic gasoline consumption 8 per cent, as compared with a 3 per cent increase forecast by the bureau. This, he said, permitted the prediction of a general upward trend.

Between 2,000 and 3,000 new wells are expected in Illinois this year, A. H. Bell told the commission members. The state now has over 2,600 producing wells he said with a present daily production of 63,000 bbls. Of this total 86,000 bbls. daily is being produced in the Salem field and 27,000 bbls. daily in the Beecher City field. Daily average production from wells in new fields was 56 bbls. he said.

The commission also received a recommendation from the Independent Petroleum Association of America that crude production east of California be held at the same level as the first three months during the second quarter. In making this recommendation, Russell B. Brown, Washington counsel for the I.P.A.A., stated:

"While demand for gasoline should show a reasonable increase in the second quarter of 1939 over the same period of 1938, gasoline stocks should be materially reduced and on June 30 should not exceed 70,000,000 bbls., approximately 10,000,000 bbls. less than they were on the same date last year when they were excessive. Total gasoline stocks, finished and unfinished, on February 28 were 84,917,000 bbls., 7,363,000 bbls. or 8 per cent below the level at the same time in 1938. Every refining district except the Louisiana Gulf Coast area had less gasoline in storage than on February 28, 1938. To achieve the storage figure recommended by the I.P.A.A. committee a larger withdrawal than usual will be required in April, May, and June.

"Taking into consideration the expected increases in gasoline demand and the necessary reduction in gasoline stocks, the following estimates have been prepared showing average crude production rates for April, May, and June of 1939: Total United States, 3,340,000 bbls. daily; east of California, 2,750,000 bbls. daily. As in previous estimates, these figures do not provide for any reduction in crude stocks. We strongly recommend, however, that during the large consuming season that there be a further reduction in stocks of crude petroleum and that the above estimates therefore, be reduced accordingly."

In commenting on general conditions in the industry, Mr. Brown stated: "There are still some producers of crude petroleum in some of the oil producing states who are producing oil from wells in such large quantities as to create underground physical waste to the detriment of the industry, the states in which this is occurring, and to the nation. These conditions can probably only be eliminated in the states that do not have conservation laws by the enactment and enforcement of adequate conservation laws. Where these conditions exist in states having conservation laws they can be eliminated in most cases through the cooperation of the producers themselves, and in all cases probably by proper enforcement of the conservation laws.

"While substantial progress has been made in eliminating situations where lack of ratable taking exists as a result of pipe line proration there are still a very few situations where this condition continues, but we are inclined to believe that practically all of these situations will be cleared up in the near future. Discrimination in purchases between pools in the same state still exists in some of the oil producing states as a result of the granting of special allowables in most instances. Progress is being made in eliminating these conditions and in one state at least an effort is being made to amend the conservation law in such manner as to make possible the complete elimination of special allowables. We again desire to stress the fact that many unnecessary wells still continue to be drilled and that this situation can only be relieved by prompt action on the part of the regulatory bodies and the industry itself."

Congress Is Cool Towards Resources Report

WASHINGTON, D. C., Mar. 20.—The action of the Senate finance committee in favorably reporting the bill to make the Connally hot oil act permanent indicates Congress is not inclined to give any consideration to the recommendation of the National Resources Committee that the act be continued only temporarily as a stop-gap pending the drafting of permanent legislation for federal regulation of the petroleum industry.

Equally significant is the fact that Secretary Ickes unqualifiedly recommended passage of the bill to make the law permanent and made no mention of any proposal for federal control, although at various times during the past year he has hinted he might have some different proposal to make when extension of the Connally Act came up for consideration. The committee ignored requests for hearings because comprehensive hearings were held two years ago when the original act was about to expire. At that time the Senate voted to make the law permanent but later accepted the House bill to extend it to June 16, 1939. In its report on the bill, the committee declared:

Act Endorsed

"The additional experience gained during the past two years further convinces your committee as to the effectiveness of the act and the need for its enactment into permanent law. Although some of those who objected to the measure two years ago and were fully heard by your subcommittee at that time continue to object, your committee is convinced the preponderant opinion of state conservation authorities and of those engaged in the oil industry favors the permanent enactment of the law. . . .

"During the four years which have elapsed since the act was approved, there has developed a widespread recognition of the fact that orderly and efficient methods of production, in which due regard is given to the maintenance of reservoir energy and the retention of gas in solution with the oil, make possible the increased ultimate recovery of oil from the underground reservoirs. . . .

"It is evident to your committee that, if the support accorded oil-producing states through the act of February 22, 1935, were to be withdrawn, much of the progress toward conservation achieved during the past four years would be lost and the oil industry would soon face the disturbances which it encountered before this measure was enacted.

"Your committee believes it highly desirable that the act of February 22, 1935, be made permanent law because it has fully demonstrated its efficacy in aiding the states in their efforts to prevent waste in the production of an essential and irreplaceable natural resource and because of the continued need of this support by the federal Government in the enforcement of their laws."

In his letter to the committee, Secretary Ickes stated:

"In brief, it is my opinion that the Connally Act, by giving strong support to the oil and gas conservation laws of the oil-producing states, has made a substantial contribution to the conservation of the oil and gas resources of the nation and also that the federal and state responsibilities in this respect have been coordinated without placing any undue burden upon the consumer of petroleum products. In fact, I am convinced that the consumer will continue to benefit if the policy announced in the Connally Act of making adequate supplies of oil available at reasonable prices is adopted as permanent legislation of the United States."

Antitrust Policy

An announcement in definite terms of the new "vigorous but selective" policy of enforcing the antitrust laws will be made in the near future by Attorney General Frank Murphy, but he added this policy is not destructive and business men will not be unnecessarily or irresponsibly harassed by investigation.

Among other things, it is understood the attorney general will approve Mr. Arnold's intention of making greater use of consent decrees to avoid lengthy and costly trials and to provide industries with something like a code of practices in the form of a definite statement, approved by the Department of Justice and the federal courts, distinguishing between practices which are and those which are not considered to be in violation of the antitrust laws. To aid in drafting and policing consent decrees, the department may call in industry specialists and marketing experts from other government departments who would be in position to view a given situation from the standpoint of both the industry and the general public. In this way a consent decree could be of more practical benefit than if drafted solely by lawyers of the Department of Justice with their necessarily legalistic viewpoint.

Natural Gas Act

The refusal of the Federal Power Commission to consider competition between different types of fuel in passing on applications for certificates for the construction of new natural gas pipe lines has had its repercussion in Congress through the introduction of a bill by Representative Everett Dirksen of Illinois to compel the commission to give consideration to this type of competition. The Dirksen bill would amend the natural gas act by defining "competitor" and "interested party" to include "any producer or distributor of coal, oil, or any other fuel used domestically, commercially, or industrially," and would require the commission to give consideration to objections of such competitors in passing on applications for construction of new natural gas lines and on natural gas rate schedules filed with it. At present the act requires the commission to consider only the objections of other gas companies, and the commission recently ruled that it has no jurisdiction over competition between different types of fuel.

STATE CAPITALS

KANSAS

THE SENATE PASSED and sent to the house Thursday a bill to revise the law exempting gasoline used for agricultural purposes from the state's 3-cent a gallon tax. Enactment of the measure would set up a refund system, to be handled through clerks of the 105 counties, in place of the present exemption permit system.

FORMAL HEARINGS TO DETERMINE market demand for Kansas oil and gas, held by the Corporation Commission the last two years, will be dispensed with for April, and next month's allowable orders based on nominations submitted by purchasers to the conservation division, Conservation Director T. A. Morgan said he did not know whether the policy of obtaining nominations direct from purchasers without public hearings would be made a permanent commission practice.

April gas and oil allowables under the new setup will be announced as near the first of the month as possible, he said.

Allowables for western Kansas gas fields for the March period total 4,058,000,000 cu. ft. daily, the conservation department reported Monday. By fields, the quotas are: Hugoton, 2,385,000,000 cu. ft.; Otis, 857,000,000 cu. ft.; Burrton, 444,000,000 cu. ft., and Lyons, 372,000,000 cu. ft.

The report shows 25 wells in the Hugoton district have no pipe line connections.

A REHEARING ON PRORATION ORDERS for the vast Hugoton gas field of Southwest Kansas has been granted by the Corporation Commission on application of the Republic Natural Gas Co., Edward F. Arn, special attorney for the state regulatory body, said Saturday.

Republic Natural, opposed to proration of gas production in the Hugoton area since first ordered by the commission last September, filed suit in federal court for an injunction against the orders as "unconstitutional." The company contends proration will deprive it of property rights and subject it to financial loss.

THE SENATE PASSED, 26 TO 8, and sent to the house Wednesday the bill to limit authority of the Kansas Corporation Commission to grant special allowables for production of crude oil.

Parting shots were fired at the measure by half a dozen senators in vote explanations that ranged from an assertion of willingness to give Governor Payne H. Ratner "a chance to demonstrate his ability" to solve the state's oil problem, to cries of "economic death," ruin and monopoly.

Asserting that the proration law has operated satisfactorily in the eight years since its enactment, Senator Kirke W. Dale (R., Arkansas City) a leader of the opposition, added the measure would "completely regiment the industry, allow price-fixing, eliminate free enterprise and competition and result in chaos."

TEXAS

HOUSE COMMITTEE ON OIL, GAS AND MINING last week postponed indefinitely the hearing scheduled for March 15 on the bill to amend present statutes so as to give the Railroad Commission control over refining activities in Texas. Some observers expected the bill would die for lack of attention, especially so in view of the opinions expressed at the statewide hearing. While most of these questioned expressed no opposition to the commission controlling refineries to a moderate degree, they felt that such action was not necessary; the same effect could be accomplished by keeping production of fresh crude within consumer demand.

MEETING OF EAST TEXAS OPERATORS has been called for March 25 for the purpose of launching a program designed to remedy pollution of streams in East Texas with oil field wastes and salt water. The meeting was called by the state Health Department and the state Game, Fish and Oyster Commission following an antipollution conference held last week in Austin at the call of Governor W. Lee O'Daniel. At the recent statewide conference, held by the Texas Watersheds Association, a resolution was passed urging that the state Health Department and state Game, Fish and Oyster Commission be given authority to undertake an extensive antipollution research program to be financed by the industries most vitally concerned.

HEARING ON THE BENNETT FIELD of Yoakum County, Texas, has been called by the Railroad Commission for March 30 at Austin. The meeting will be held for the purpose of considering revisions to present operating rules. Development in the Bennett field has been along the lines of 20-acre spacing. In the nearby Wasson field, 40-acre spacing is being used although field rules call for 20-acre spacing but giving wells on a 40-acre proration unit twice the acreage allowable of a well on a 20-acre unit. Present indications point to the fields being located on a common reservoir so that the problem of the different spacing patterns may enter the picture.

Art L. Walker, of Oklahoma City, Okla., secretary of the Interstate Oil Compact Commission, was the first oil conservation officer in the United States. Back in 1915 when the first conservation act was passed, he was appointed umpire in the Healdton and Cushing fields. In 1917 when another conservation bill was made a law he was appointed chief conservation officer of the state. Later Governor Williams appointed him to fill a vacancy on the Oklahoma Corporation Commission and in 1918 he was elected to the office and served six years. Mr. Walker has had practical experience in the producing end of the oil industry.

OKLAHOMA

MARKET DEMAND HEARING to fix allocation to Oklahoma fields for the April proration period will be held at the capitol on the afternoon of March 29, it was announced by Reford Bond, chairman of the Corporation Commission, Saturday.

At 10 o'clock that morning, purchasers and producers have been called for a conference with W. J. Armstrong, chief conservation officer. At that time a survey of field conditions will be made. The state's present allowable is 428,000 bbls. daily.

SEMIANNUAL POTENTIAL TESTS on gas wells in the Oklahoma City field will start Monday morning, under direction of state conservation officers, W. J. Armstrong, chief conservation officer, announced Saturday. The agents will test from six to a dozen wells daily, and expect to complete the work by the end of April.

All wells will be shut in for sufficient time before the test to establish the shut-in pressure. Wells to be gauged by the back-pressure method will be required to shut in for 24 hours before the test starts.

TEN-ACRE WELL-SPACING or proration units were ordered for the Hazel pool of Seminole County, by the Corporation Commission Saturday, ruling on petition of W. A. Villines and others. The order covers the SE Section 22, SW and SE Section 23, and NE and SE Section 27, all of Section 26, SE and SW Section 25, and all of Sections 35 and 36-7n-5e.

A score of wells have been drilled in the pool, production being in the Earlsboro sand at around 2,980 feet; average initial production is 100 bbls. daily, but settles to 40 to 50 bbls., the petitioner stated. Ultimate recovery is expected to reach 5,000 to 7,000 bbls. per acre.

MICHIGAN

OVER PROTESTS OF A SMALL MINORITY, the Michigan House of Representatives passed March 15 and sent to the senate the state oil control bill described by Dr. R. A. Smith, state geologist, as a better oil control measure than that possessed by any other oil state. The vote was 79 to 8, with Representative Gail Handy, of Eau Claire, and Representative Fred L. Kircher of Lansing, leading the opposition.

Chief sponsors of the bill in the house were Representative Alexander M. MacKay, West Branch, and Representative Bernie F. Hampton, Harrison.

CALIFORNIA

THE EMERGENCY EXECUTIVE COMMITTEE at a meeting held in Los Angeles recommended to the Central Committee of California Oil Producers, chief curtailment group, that the report of the Fact Finding Committee be approved in principle with reservations and the Central Committee after approving the recommendation referred the report to the allocation committee for further study and a report on March 28. The Central Committee voted to elect an entirely new group of field committees to direct future curtailment of crude oil. Lawrence Vander Leck, chairman of the Central Committee, appointed a field committee election board consisting of H. S. Stark, Ross McCollom, Emil Kluthe, W. C. Whaley, William Keck, Jr., R. M. Sperry, W. H. Geis, Warner Clark, and Joseph Jensen.

Operators failed to vote on the report of the Fact Finding Committee to the extent desired as many failed to send in ballots. A total of 163 operators representing 411,500 bbls. of daily production were all that voted. Of this number, 126 operators representing 64,354 bbls., approved the report in principle, 24 operators representing 222,642 bbls. approved the report in principle but not in formula, and 13 operators representing 124,548 bbls. of production did not approve the report in either principle or formula. In the meantime, crude oil production in California continues out of line with consumption with the result that additional quantities of crude and refined oil is being put into storage. Production in the past week averaged 640,750 bbls. per day.

The OIL AND GAS JOURNAL

PRODUCING REFINING NATURAL GASOLINE PIPE LINE

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Critical Period

The state-wide proration hearing before the Texas Railroad Commission at Austin last week was held under the shadow of the revived agitation for federal control of the oil industry. It pervaded the atmosphere and was in the minds of all present.

The injection of national defense as an argument for government regulation of natural resources was taken as increasing the risk that pressure might be brought upon Congress for action during the present session, possibly a matter of a few months.

This impression, generally shared, emphasized the extreme need for care at this critical period, since it was felt that one false move on the part of the industry or of the commission might precipitate the issue.

Those at the hearing were keenly aware of the grave responsibility that rests upon the Railroad Commission at this juncture, and the urgent necessity that it should continue to supply the leadership in cooperation with the industry required to solve the pressing problems of the day.

Vigilant critics are alertly watching for any slip that may be used in promoting the plan for federal control.

Fortunately, the procedure inaugurated at the December 12 hearing was again followed, demonstrating anew the value and importance of having such a forum where qualified representatives of the industry can exchange facts and figures before the commission for the guidance of both the regulatory body and the industry.

The hearing was marked by the same spirit of cooperation and the testimony of company representatives qualified by authority and knowledge to present a factual picture of the situation and conditions. What remains is appropriate action.

This is the democratic way, representative self-government functioning in a free and fruitful economy. Whatever economic difficulties the oil business has faced, or is facing, have reacted upon the industry itself, and not at all upon the public as consumer or upon the national interest in a natural resource, or as a factor in national defense.

The conservation policy being pursued by the industry has been justified by the establishment of the largest reserves of oil in our history. It has prevented wasteful exploitation and taken advantage of every advance in engineering science to prolong the producing life of our fields. At the same time, the manufacturing division has enormously increased the yield of products, conserving hundreds of millions of barrels of crude.

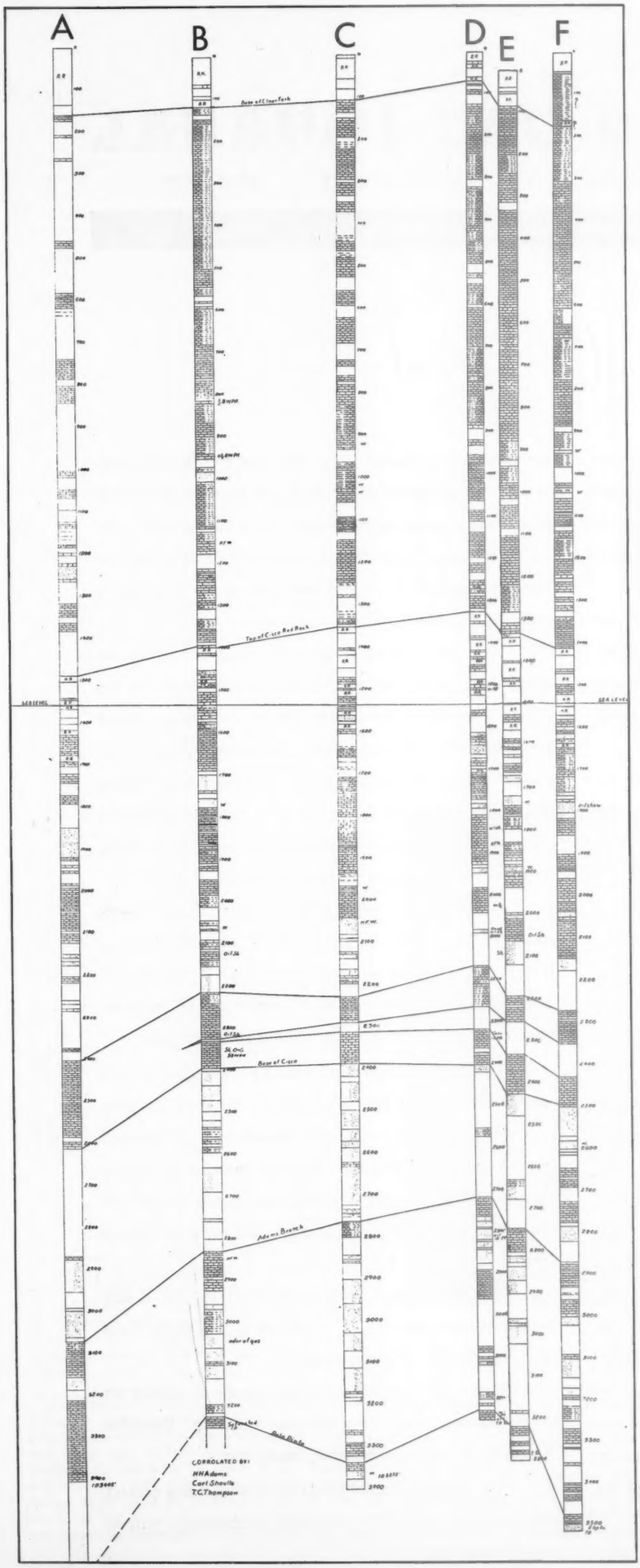
Today the oil industry of the United States stands ready to step up its supply 25 or 50 per cent at a moment's notice should emergency require. It has the oil, the transportation system, the manufacturing facilities, to meet any conceivable demand, in peace or war.

All this has been developed by free initiative and enterprise under the American system. No other industry is so well equipped to respond immediately to any call for defense of the country. And the percentage of any imaginable demand for war purposes would be far less compared to total demand, supply and reserves than it was in 1917.

Although we are today producing three and a half times more oil than in 1917 we have nearly three times the reserves known at that time.

These facts are the industry's answer to clamor for federal control of oil as a defense necessity. Proration was a large factor in bringing these about.

The industry should hold fast to what it has gained, realizing fully that any weakening or dissension will invite dictatorship.



Lower Canyon in West

By H. H. ADAMS

Carl Shoults and T. C. Thompson, Collaborators
Consulting Geologists, Abilene, Tex.

Discovery of oil in the lower Canyon beds of the Pennsylvanian age in Jones, Haskell, Stonewall and Shackelford counties has created a new interest in West Central Texas. The Palo Pinto horizon has been producing for many years in Brown and Callahan counties but the fact seemed to be overlooked or forgotten until the Avoca pool was brought in.

W. I. Southern, Inc., brought in No. 1 Carlile from the Palo Pinto lime in Stonewall County which was followed by Forest Development Co. and others No. 1 Pardue in Haskell County, producing from the Adams Branch lime. Three good pools have been developed in the Avoca area of Jones and Shackelford counties; the discovery pool, the Griffin pool and the Ivy pool. Recovery per acre is going to be high in these pools. Although the pools are not very large, they will be highly profitable.

The geological history of this area is well known to the geological fraternity but a brief outline here will throw enough light on the subject to help the average reader to understand the situation.

Geological History

Before the Mississippian beds were laid down in Texas, Arkansas and Oklahoma, there was a low gentle down-fold or syncline which started in Arkansas, came through to Central Texas, and extended north into southern Oklahoma. The beds deposited were known as the Burnett shale of Mississippian age and were black and carboniferous. Pennsylvanian beds were deposited on the Burnett shales with no great unconformity. These beds were known as the Bend or black lime beds. Deposition continued without interruption and filled or levelled the synclinal basin in which they were deposited. These sediments came in from an easterly direction and were carbonaceous, black shales and black and gray lime.

At the end of Bend times a mountain range was formed which extended from Waco north into Oklahoma and followed the Balcones fault line. At the same time the Llano Mountains were formed. Coming off of the Llano Mountains in a northerly direction, a long gentle arch was formed known as the Bend Arch. It extended into Archer County from the Llano Mountains. The south end of this arch was exposed to erosion but the synclines and north end of the arch were covered by the Strawn Sea. Sediments from the newly formed range of mountains to the east, rapidly filled the Mineral Wells basin which is the east side of the Strawn basin. These sediments were coarse, angular chert, coarse sands and gravel and shales with some lime. This deposition continued to the end of Strawn times with no marked interruption, and by this time the mountains to the east were worn down. The Canyon beds were then deposited on top of the Strawn.

It is the transitional period between the Canyon and Strawn that we are most interested in, since it concerns the accumulation of oil and the structural conditions which we are outlining here. At the end of Strawn times this area was alluvial plane; shales, sand and conglomerates rapidly alternated. Much of the older material was reworked and redeposited. The beds were irregular in thickness, extent and type of material. A great time period must have elapsed before the deposition of Canyon beds began. The Palo Pinto lime, which is generally classified as Canyon, could be just as conveniently classified as Strawn, and from the facts set

Fig. 1: A—Felmont Corp. No. 1 A. D. Woodson, alt. 1,544. B—Ungren & Frazier No. 1 J. M. Griffin, prod. 931, alt. 1,535. C—Murray & Harrison No. 1 J. H. Rial, dry, alt. 1,535. D—Iron Mountain Oil Co. No. 1 Carl Olander, alt. 15,45. E—Maracaibo No. 1 Carl Olander, 4,000, alt. 1,592. F—Murray & Harrison No. 1 Aiken & Little, dry, alt. 1,544

yon Production Central Texas

Heavy-duty Diesel-electric rotary drilling in Griffin pool, most recent Palo Pinto discovery

out, it seems that it more properly belongs to the Strawn group.

After the Palo Pinto lime had been deposited there was evidently some folding or a long time period whereby deferential settling took place before the overlying beds were deposited. The prevalence of reef material found in the Pardue area, as well as in other areas where the Canyon has been tested, the presence of conglomerates immediately overlying the Palo Pinto beds and the great variation of the intervals between the Adams Branch and the Palo Pinto lime add proof to this conclusion. The unconformity is not as marked at the outcrop as it is through Jones, Stonewall and adjoining counties.

During Canyon times there was an extensive but shallow sea with rapidly changing shore lines and depths that give a great variety of strata. Following the Canyon, the Cisco beds were laid down. The mountain range to the east had been eroded and furnished no material for the Cisco beds but the Arbuckle uplift and reworking of the Canyon and possibly the Strawn, furnished the material for the Cisco strata. The Cisco Sea extended farther west and did not extend to the east as far as the Strawn basin. This gives a brief outline that may help in an understanding of this situation.

On the cross section of the Avoca area, Figure 1, it shows structural conditions much stronger in the Palo Pinto than in the overlying Adams Branch. It also shows the structure in the Cisco beds overlying the Canyon group to be less marked than on the Adams Branch. The Wichita-Albany beds show even less structure than the Cisco. Any surface structure may thus be considered a representative of a much larger and more pronounced structure on the Adams Branch and particularly on the Palo Pinto lime.

In Jones County there is a pronounced anticlinal fold shown on the surface running in a northeasterly direction from the Avoca pool. This structure on the surface does not show more than 35 feet of southeast dip into the synclinal trough that parallels it. There have been only a few wells drilled deep enough in the synclinal trough to locate the Palo Pinto, but the best information at hand shows that on the Palo Pinto beds there is more than 300 feet of southeast dip, which will make structure in the Palo Pinto 10 times as great as is shown on the surface.

The surface structure in the Avoca pool could not be definitely determined but the subsurface shows a very small structure mapped on the top of the Wichita-Albany beds which are not more than 100 feet deep. This structure, however, is a plunging anticlinal nose; part of the general fold that extends in a northeasterly direction. In the Ivy pool surface exposures are good and show a very pronounced anticlinal nose which was worked and led to the discovery of the pool.

To summarize the relation between the surface and subsurface structures, the areas now producing in the Palo Pinto lime have surface structures that are definite and clearly defined. These surface structures could not all be determined without core drilling, but wherever there are exposures it is a definite fact that the plunging nose without closure immediately overlie closing structures in the Palo Pinto lime.

The cross section presented was made from Aiken & Little No. 1 in Section 172, shown on the accompanying Figure 2, running through the discovery pool, crossing a saddle between the two pools, going to the discovery well in the Griffin pool thence south to Woodson No. 1 Felmont which was off the structure and deep in the syncline. The following facts are worthy of consideration. It will be noted that on the base of the Clear Fork, Iron Mountain No. 1 Olander is the highest of the group. The dip south and east to Aiken & Little No. 1 is questionable due to the fact that the log was not kept in careful detail. However, it shows a surface reversal.

Another correlation made is on top of the Cisco red bed which shows Iron Mountain No. 1 Olander running 09 feet higher than the Aiken & Little. The J. H. Rial is running 30 feet lower than the Olander. The J. H. Rial was drilled on the saddle between the two structures. The normal dip between the Rial and the No. 1 Griffin is equivalent to the dip on the logs. The No. 1 A. D. Woodson which was drilled south of the Griffin well shows 60 feet of south dip on top of the Cisco red bed.

The next correlation is shown on the base of the Cisco. Very little variation is noted in the Cisco. There is still only 90 feet of dip from the Olander well to the Aiken & Little well on this horizon. There is, however, 185 feet of dip from the Griffin well to the Woodson well shown on the base of the Cisco.

The next correlation is on top of the Adams Branch lime. From the Iron Mountain No. 1 Olander to the Aiken & Little a dip of 155 feet is shown on top of the Adams Branch lime and a dip of 220 feet is shown on the Adams Branch line from the Griffin to the Woodson. To the top of the Adams Branch lime there has been a gradual increase in the size of the subsurface structure but the greatest change occurs between the Adams Branch and the Palo Pinto lime. From the Iron Mountain No. 1 Olander to the Aiken & Little there is a dip of 255 feet from the Olander to the Rial which is located on the saddle between the two structures, the section has increased to 580 feet while on the Olander it is 510 feet. The Wood-

(Continued on Page 41)

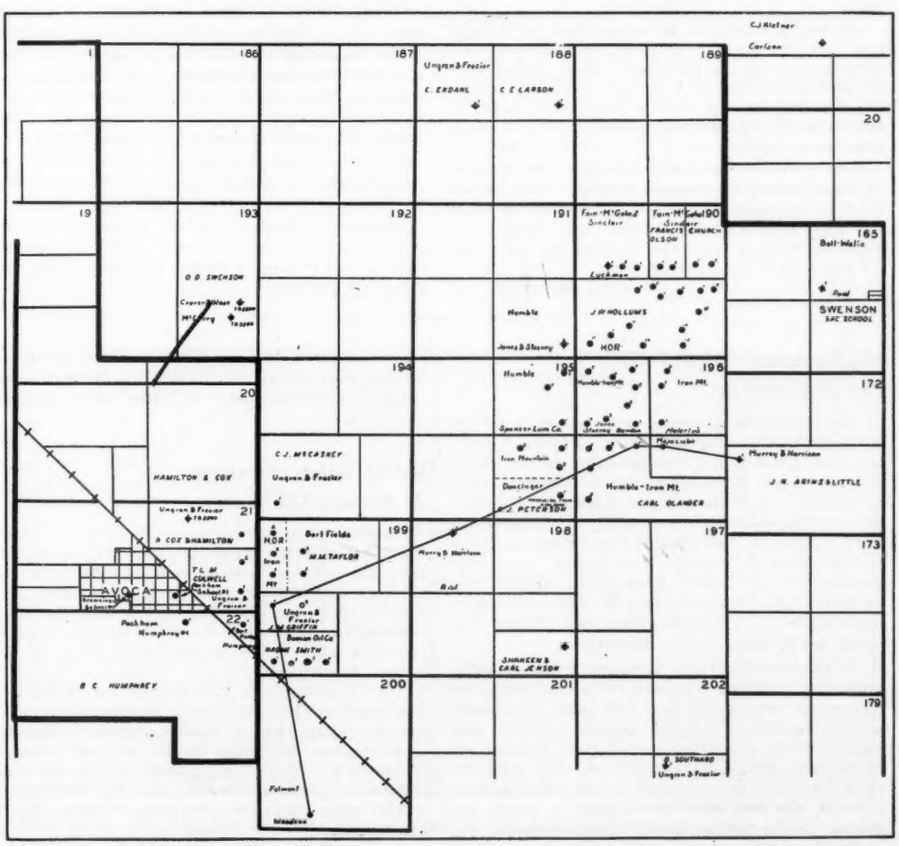


Fig. 2—Map of the Avoca and Griffin pools in Jones County, West Central Texas, showing line along which the correlation was made

Appalachian Geological Society Discusses Deep Sand Tests

MORGANTOWN, W. Va.—A large attendance of the Appalachian Geological Society met for dinner and discussion at the Hotel Morgan in Morgantown March 13 after an afternoon spent with the West Virginia Geological Survey in the University of West Virginia. Dr. Paul H. Price, state geologist of West Virginia, presided at the dinner and after a cordial welcome turned the meeting over to R. C. Lafferty, president, who presented the petrography and costs of the deep test on the Louis Maxwell farm at Archers Fork in West Union Township, Doddridge County, West Virginia, with references to the temperature by C. E. Van Orstrand of the U. S. Geological Survey, and a comparison to other temperature surveys in deep tests.

H. R. Brankstone, Gulf Oil Corp., geological department, presented a study of the deep test on the James McBurney farm in Mount Pleasant Township, Washington County, Pennsylvania, with a completed record of its samples and the division of the different geologic ages.

Robert C. Lafferty, Owens Illinois Glass Co., president, Appalachian Geological Society; Mrs. Gordon Gulley; Dr. Paul H. Price, state geologist; Mrs. Lafferty; M. Gordon Gulley, Gulf Oil Corp.

sented the vice president in charge of the northern division of the society, M. Gordon Gulley, of Gulf Oil Corp.

Mr. Gulley introduced the speakers and led the general discussion. Quinton L. Wilcox, engineer with Carnegie Natural Gas Co., presented a digest of deep sand developments in Southwest Pennsylvania which covered Onondaga and Oriskany drilling from Beaver County to eastern Westmoreland County, particularly with reference to convergence.

Ray V. Hennen, consulting geologist, Morgantown, W. Va., discussed the deep test drilling at 7,625 feet on the Paul Dunham farm near Wymps Gap in Springhill Township, Fayette County, Pennsylvania, which is being drilled by L. J. Houze Convex Glass Co., and which has gas pays in the Onondaga lime.

A. Y. Barney, geologist, Columbian Carbon Co., presented the vice president in charge of the northern division of the society, M. Gordon Gulley, of Gulf Oil Corp.

An interesting study of the petrography of deep sand wells was presented by Dr. J. H. C. Martens, University of West Virginia and the West Virginia Geological Survey, which called attention to significant compositions indicating changes in formations particularly in the lower Devonian with comparisons from the Poca-Elk field near Charleston, W. Va., and Chestnut Ridge, Fayette County, Pennsylvania.

The next meeting will be held in Ashland, Ky., under the sponsorship of the southern division of the society to which many members and their wives and guests are expected.

Mid-Continent Strike Talks Fail of Settlement

The conference between representatives of the Oil Workers Union and the Mid-Continent Petroleum Corp. last week resulted in a deadlock. The meeting called at Tulsa March 17 was attended by Governor Leon C. Phillips; J. C. Cooper, federal conciliator; J. C. Denton, general counsel and spokesman for the company; Fred B. Koontz, vice president in charge of manufacture; John L. Coulter, international union vice president; R. H. Stickel, international union representative; Jack Hays, local union leader; Jack Chaffin, union leader from Wewoka, Okla., and Wildcat Williams, special agent for the governor.

It was announced the company would reemploy those men now on strike who were not discharged "for cause" and who are not held guilty of unlawful acts, if, as and when plant operation justifies, with plant seniority; that the rights of those men accused of unlawful acts will be protected, that they will have a hearing on the charges by the company management, and that they have a right to appeal any decision to the National Labor Relations Board.

On March 20, Governor Phillips reduced the troops on duty from 100 to 60. Originally there were 250 on strike duty. There has been a notable decline in vandalism during the past week. J. C. Denton stated no new move toward a settlement was to be expected before J. L. Coulter and J. C. Cooper return to Tulsa next week.

Sound Safety Practices At Houston Oil Show

In addition to putting on a valuable and instructive safety program, the safety committee will inaugurate safe practices with periodic inspections at the Oil-World Exposition in the Coliseum at Houston, Tex., April 24 to 29, inclusive. The final program has been announced by J. J. Delahide, chairman, who has appointed a subcommittee to take active charge of the various departments.

One committee with F. P. Werner, safety engineer for American Petroleum Co., chairman, will have charge of inspection of buildings, grounds, displays, demonstrations for safety guards and safe practices and operations of moving machinery. A first aid room will be located in the building and its maintenance will be under supervision of William T. Raney, American Red Cross.

Demonstration on fires, explosions and approved safety equipment will be given daily by the Bartlesville, McAlester and Dallas stations of the U. S. Bureau of Mines. The bureau's rescue truck and equipment will be on display and a drilling well will be equipped with all safety devices to show the most modern devices now available. This work will be directed by G. M. Kintz, associate engineer, U. S. Bureau of Mines, Dallas.

The safety meetings will start at 6:30 p.m., April 27, with a stag party, including barbecue and entertainment, at the Texas Co. Club House, Camp Beatty. This event will be for safety engineers, field men, oil company employes and their families. Fred Rousseaux, Texas Co., is chairman of the committee in charge.

On the following morning, April 28, a meeting will be held in the Music Hall of the Coliseum, with T. S. Maffitt, Houston Oil Co., presiding. An address on "Safety Meetings From the Field Men's Viewpoint" will be given by R. M. Bradbury, superintendent for Houston Oil Co., Kilgore, Tex. This will be followed by a talk on "Oil Field Fleet Operations," by M. E. Brock, assistant to the vice president, Gulf Oil Corp. S. E. Whiting, vice president of Liberty Mutual Insurance Co., Boston, Mass., will give a demonstration on resuce of workmen from tanks and enclosed places.

In the afternoon there will be a meeting in the Music Hall with P. E. Keegan of the personnel and employment department of Shell Petroleum Corp., presiding. Speakers will be Daniel Harrington, chief safety engineer, U. S. Bureau of Mines, Washington, D. C., and J. J. Forbes, supervising safety engineer, U. S. Bureau of Mines, Pittsburgh. Demonstrations on petroleum fires, gases, explosions and permissible equipment will be given by G. M. Kintz, associate engineer, Bureau of Mines, Dallas, Tex.

At 7:30 p.m., April 28, a general meeting will be held in the Music Hall with C. A. Miller, assistant personnel manager, Texas Co., presiding. A. A. Nicholson, personnel manager for Texas Co., will speak on "Is Industry at the End of the Road?" This will be followed by presentation of trophies and medals by Governor W. Lee O'Daniel of Texas to the petroleum industry's employes who have saved lives of fellow-workmen by first aid and rescue methods.

According to Ed G. Lenzner, general manager of the Oil-World Exposition, the safety committee has done exceptionally good work in the preparation of the safety program and has taken all precautions against hazards of any kind that might arise during an event of this magnitude. The committee consists of the following members: J. J. Delahide, B. F. McDonald Co.; R. B. Roaper, Humble Oil & Refining Co.; C. A. Miller, Texas Co.; C. L. Hightower, United Gas System; P. O. Keegan, Shell Petroleum Corp.; F. P. Werner, American Petroleum Co.; L. B. Conner, Texas Co.; H. L. Rankin, Gulf Oil Corp.; G. J. Gruber, Mine Safety Appliances Co.; R. H. Horde, Shell Petroleum Corp.; T. S. Maffitt, Jr., Houston Oil Co.; William Grant, Jr., Humble Oil & Refining Co.; C. M. Liles, Magnolia Petroleum Co.; Howard G. Bourne, American Optical Co.; Don Cross, Accident Prevention Co.; J. L. Manes, Sun Oil Co.; J. L. Risinger, Magnolia Petroleum Co.; E. W. Breeland, Lone Star Gas Co.; H. B. Williams, Pan American Petroleum Co.; William T. Raney, American Red Cross; G. M. Kintz, U. S. Bureau of Mines; E. G. Lenzner, Oil-World Exposition, Inc.; Joe H. Russell, Gulf Oil Corp.; C. W. Coleman, Gulf Oil Corp.

THE MARKETS*

CRUDE OIL: *A reduction of 14 cents a barrel was posted by Ben Franklin Refining Co. in Oscar, Seay, and Spring areas of southern Oklahoma, affecting about 1,200 bbls. daily. General market steady, with feeling among operators hopeful.*

REFINERY: *Gasoline gaining strength as motoring conditions improve. Rising stocks causing less concern as outlook brightens. Refiners liquidating inventories of heating fuels. Lubricating oils in sounder position. Wax vigorous. Heavy fuels firmer.*

TANK-WAGON AND POSTED DEALER: *Major refiners advance gasoline and kerosene at subnormal points in Oklahoma and Texas. Scattered changes elsewhere.*

FINANCIAL: *Along with market generally, oil shares dipped sharply on European news. Average of 30 representative stocks for week ending March 18: High, 28.53; low, 26.72; close, 26.86. Week ending March 11: High, 28.70; low, 27.44; close, 28.40.*

*Detailed information in market section.

Looking south towards Blankenship Point across Lake Centralia. Roadway at left is separate lease

Roadway strip in Salem field. Only two wells show but there are four in 100 feet square

Illinois Basin Field First Major Sand Discovery of Year

By HARRY F. SIMONS

CENTRALIA, Ill., Mar. 20.—The first major sand discovery of the year in Illinois was in the making late last week with the announcement that Pres Cochrane and G. H. Blankenship No. 1 Oak Grove Cemetery, SE SE SW Section 15-3s-3w, Washington County, was showing for a producer in the Benoist sand topped at 1,267 feet. The well has been drilled to 1,288 feet, and while incomplete, it has swabbed 200 bbls. of crude in 24 hours and is expected to yield a larger volume of crude if the well is given a shot of nitroglycerin. At last report the oil was slopping over the top of the casing. Already several new locations have been reported but their legal descriptions are as yet unavailable. Cochrane and Blankenship are reported to have made two locations, one on the cemetery lot and another on a roadway close by, while W. C. McBride, Inc., is reported to have made two locations northeast of the well.

The well took on added significance in view of the recent discovery of Benoist production in Blankenship No. 1 Dennis in the NE SW NE Section 14-3s-3w, Washington County, which was completed as a producer on February 27. The difference in the surface elevation makes the second well run about 30 feet higher on the structure than the first one and indicates the major part of the structure may be southwest or the new well. The first well was shut in because of lack of tankage before an accurate test of its productivity could be made. It is a commercial producer and indications are the latest well will be better. The area is hampered temporarily by lack of a pipe line connection but if it develops as indicated this should be cured before many wells are drilled due to the ownership of the offset acreage.

With only two wells drilled on the structure to date any estimate of its size is still in the "prophecy" class. However, the area has been extensively seismographed and all of the major lease holders in the area have an accurate picture of the subsurface strata. Considerable work was done in the area by magnetometer and torsion balance crews before work was started on the first test.

At present, the only part of the structure proven is between the two wells. The preliminary work and the two test wells indicate the first well was drilled on the edge of the pool and better chances can be expected to the southwest.

Best estimate of the pool from the exploratory work shows it may cover approximately a total of 8 square miles and all or part of 12 sections. The structure is outlined as covering all of Sections 10, 15, 22, 27-3s-3w and about half of each of the following sections: E half of 9, 16, 21, 28 and the W half of 11, 14, 23, and 26-3s-3w. All of the structure may not be proven productive but the field has a good chance of covering that area.

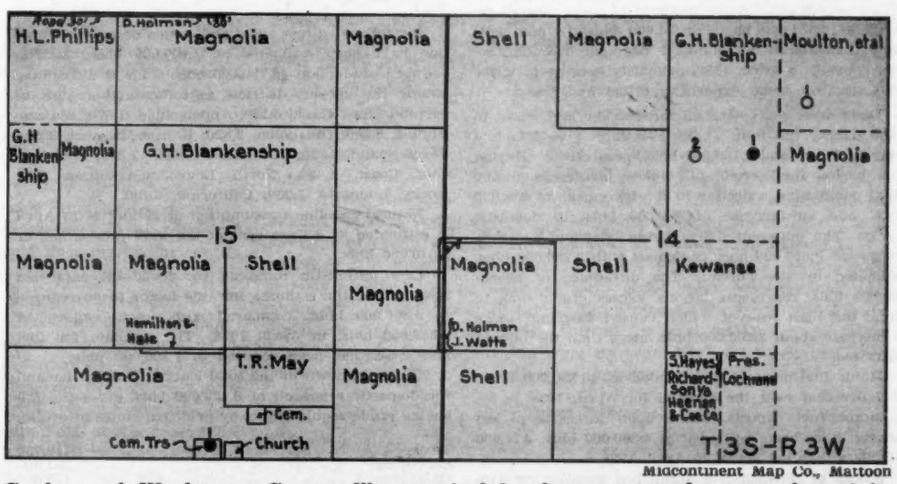
The new field will probably not compare with the two major sand fields of the state, the Louden and the Salem pools, as it does not have the sand thickness of those two areas. While both of the major pools differ as to detail both have thick sand pays, often reaching as much as 60 feet in the Benoist. There is also considerable variation locally in each of the major pools. Maximum estimated thickness of the Washington County Benoist is between 25 and 40 feet. This would make the new field compare with the Centralia townsite area where 25 feet of thickness was common.

The structure, an anticline, is along the DuQuoin anticline, the principal geologic feature on the western side of the Illinois basin. The Centralia townsite, the Salem pool and the Loudon pool are local traps formed by this major warping of the sediments. While Illinois has indicated some good production in the center of the basin, the local pools along this feature have attracted the principal attention during the past year. Both major and independent operators think highly of it as is indicated by the wide play along it. The recent Gallatin County flurry was caused by what looked like a discovery along its southeastern flank.

The new well will force five offsets and work on leases owned by Magnolia, Shell, and McBride in the area will get under way as soon as the weather permits and a test is made on the well. Shell and Magnolia occupy most of the structure, with Blankenship holding a considerable spread. Some of the latter's leases are in partnership, some of them with Magnolia Petroleum Co.

With majors interested in the pool, it is unlikely the production from this source will lack an outlet as Magnolia can use this production in its Lubrite refinery at East St. Louis.

Another factor that will add impetus to devel-



Midcontinent Map Co., Mattoon

Cordes pool, Washington County, Illinois, which has been put into the major class of discoveries by Cochrane & Blankenship No. 1 Oak View Cemetery, SE SE SW Section 15-3s-3w. The church lot adjoining was leased by G. H. Blankenship

opment of the area is the presence of several Illinois "roadway" leases. This situation is peculiar to the state where the leasing of old roadways has caused the major companies a lot of inconvenience in both the Loudon and the Salem field, particularly in the latter. Many wells drilled in that area were forced by the presence of old roadways which were not included in the original leases taken on the land.

Subsequent leasing and development on these narrow tracts, often only wide enough to hold a rotary rig, caused the drilling of numerous offsets which otherwise would have been unnecessary. This has been a thorn in the side of Texas Co. at Salem. On the new structure there are two such roadways, one extending through an 80-acre tract owned by Magnolia in Section 15. Another roadway in Section 14 extends along the north and west sides of a 40-acre tract of Magnolia in the NW SW of that section.

If the owners of these leases choose to drill on them Magnolia will be forced to drill as many unnecessary locations to protect itself.

Trading in the area has not been particularly active during the past few months as most of the major blocks were taken before the pool discovery on February 27, 1939. The roadway leases have attracted attention and there was rush to get in on these.

Both tests drilled to date have used cable tools and much of the development in the area will probably be by this method. While there are many rotary rigs in the state most of them will be busy in further drilling in the Fayette and Marion County fields.

Magnolia is the largest lease holder close around the area indicated by the two wells, Shell comes next, then Blankenship and Kewanee and McBride. Magnolia has a total of 1,060 acres close in, owning leases in entirety or in partnership with Blankenship who has 320 acres and a half interest in 120 more. Shell has 440 acres close in, Kewanee Oil Co. has 40, and McBride Oil Co. has 20 acres. McBride also owns several other leases in the area. Shell and Magnolia have large blocks in the surrounding sections although they are broken enough to make the development quite active during the summer.

At present time field conditions in the area will not permit economical moving and a delay of about a month may be expected before much work can be done in the field.

PENNSYLVANIA RESERVES

(Continued from Page 21)

A striking feature which is peculiar to the water-flood fields of New York, particularly to the Bolivar field which represents 34,000 of the 36,000 floodable acres in the state outside of the New York portion of the Bradford field, is that development has been retarded. This has been due to the fact, pointed out in the report, that, "the amount of daily production has been on a daily demand basis, limited to the requirements of the various pipe line companies running crude from the field." The Bolivar field will likely represent the water-flood area with the longest life in the Pennsylvania region if production is maintained on the requirement basis. If for any reason development of this area were stimulated it would be easily possible to increase the rate of production substantially which of course would shorten its life expectancy.

Curves depicting the actual production and estimated decline of natural production for Pennsylvania are shown in the chart. The first appreciable effects of water-flooding are apparent in 1904. Since that time, a total of 148,000,000 bbls. of oil has been produced through the use of water-flooding. This total is shown by the shaded area in the graph. The effect of one of the "numerous economic factors" mentioned earlier is apparent in the actual production curve of the Pennsylvania graph. This curve could be interpreted to indicate that production began to decline in 1938, when, in reality, production was curtailed due to proration which was in effect for nine months of the year.

Another chart shows production and estimated decline of natural production for New York. The total oil recovered as a result of water-flooding is calculated from 1918. The shaded area in the graph represents 40,000,000 bbls. of oil recovered through the use of water-flooding. Here again, as in Pennsylvania, the drop in production in 1938 does not indicate a decline in production but rather the result of proration.

In estimating the reserves of West Virginia, (see chart), the production-decline curve method was used in calculating the possible future production from the areas and sands now producing naturally. However, secondary recovery methods have been used in only a small number of the fields in the state and since successful air and gas repressuring is an already proven fact in the shallow fields, the additional reserves possible by reason of secondary operations and those obtainable from proven underlying sand bodies not yet developed have been considered in the survey report in arriving at the reserve estimate for the state.

Since production of Pennsylvania Grade oil is not segregated from that produced in the rest of the state prior to 1930, calculation of reserves in Ohio (see chart), presented an unusual problem. Because of the similarity of the producing sands, the thickness of pay and drilling depths common to each state, the average production decline curve used for West Virginia was also used in calculating the future production of Pennsylvania Grade crude oil in southeastern Ohio. The period 1932-35 was used as the basis for projecting the rate of future production. A sharp production peak was reached in 1927 due to the discovery of the Cambridge field. There was a rapid decline from 1927 to 1932 following the opening of that field and it was not until 1932 when the decline of production attained a rate that could be regarded as normal. It may be noted in the Ohio graph that there is a distinct drop from the normal rate of decline in the years 1937 and 1938. This is accounted for entirely by the temporary loss of markets due to the closing of several refineries running Ohio crude.

Gasoline Demand in April to Gain Seven Per Cent

WASHINGTON, D. C., Mar. 20.—The Bureau of Mines forecast for April estimates the daily average supply of domestic crude required to meet market demand at 3,434,000 bbls., or 94,000 bbls. (3 per cent) more than March but almost 1 per cent less than actual demand in April, 1938, primarily because of lower estimates for crude exports and fuel and losses.

Daily average crude oil production and runs to stills during the four weeks February 4 to March 4 were 3,331,000 and 3,169,000 bbls., respectively. During this period total crude oil stocks increased 251,000 bbls., comprising a decline in foreign stocks of 238,000 bbls., and an increase of 489,000 bbls. in domestic stocks. The apparent daily average demand for February was 3,313,000 bbls. compared with 3,220,000 bbls. estimated by the bureau. The difference of nearly 100,000 bbls. represents largely excess crude runs to stills, the high rate of which caused gasoline stocks to increase about 2,200,000 bbls. more than the bureau estimated.

Motor fuel demand is estimated as 46,300,000 bbls., or 7 per cent over the demand for April, 1938.

Motor fuel exports, based upon forecasts of exporters, have been estimated as 4,300,000 bbls., 174,000 bbls. less than the actual in April, 1938.

Stocks of finished and unfinished gasoline on January 31 were 79,466,000 bbls. According to statistics of the American Petroleum Institute these stocks increased sharply during February, possibly reaching 87,000,000 bbls. as of February 28. The bureau estimates a gasoline-stock reduction of 2,800,000 bbls. for April.

Benzol and direct sales and losses of natural gasoline have been estimated as 1,100,000 bbls., making refinery production 46,700,000 bbls. This is distributed among the various districts as follows (thousands of barrels): East Coast, 6,120; Appalachian, 1,670; Indiana-Illinois, 8,550; Oklahoma, 2,820; Kansas-Missouri, 2,270; Texas inland, 3,320; Texas Gulf Coast, 12,200; Louisiana Gulf Coast, 1,420; North Louisiana-Arkansas, 920; Rocky Mountain, 1,220; California, 6,190.

Natural gasoline consumption at refineries in April is estimated as 6.3 per cent of the total production, or 2,940,000 bbls.

Less optimistic forecasts by crude oil exporters have caused the estimate for this factor to be reduced to 5,300,000 bbls., compared with actual exports of 7,553,000 bbls. in April, 1938. The estimate for fuel and losses has been reduced to 1,800,000 bbls.

The breakdown of the total estimated daily demand for domestic crude oil of 3,434,000 bbls. gives the following crude requirements by principal states of origin:

Texas	1,412,700
California	592,000
Oklahoma	473,300
Louisiana	262,000
Kansas	152,700
Illinois	149,300
New Mexico	115,300
Arkansas	53,300

Obituaries

EDWIN C. CATLETT, 52, Tulsa oil producer, died last week. He was born in Virginia and moved to Indian Territory in 1894.

RAY A. EATON, 34, chief clerk of Danciger Oil & Refineries, Inc., refinery in Pampa, Tex., died last week of pneumonia after three days' illness, ascribed to the Panhandle's worst dust storm in years.

CHARLES B. GARNETT, 51, of Denver, president of Oil City Petroleum Co., which drilled several wells in Archuleta County, died at Santa Fe, N. M., last week as a result of an automobile accident.

ERNEST R. FAIN, Wichita Falls, Tex., of Fain-McGaha Oil Corp. and associated in the operations of W. B. McClurkan & Co., succumbed to a heart attack Saturday, March 18, in Dallas. He was an active member of the North Texas Oil and Gas Association and the Mid-Continent Oil and Gas Association.

MICHAEL A. SPELLACY, 81, died recently in Colombia. A native of Conneautville, Pa., he began in the Bradford field as a tool dresser for Spellacy & McTammany, and became a producer in the Lima, Ohio, field, and in California, where he organized the Mascot Oil Co. He worked for Sir Weetman Pearson, and E. L. Doheny in Tampico, Mexico, and later conducted explorations in Peru, and in Colombia.

INTERNATIONAL

Mexican Conference Ends Temporarily Without Solution

The series of seven or eight conferences between Donald R. Richberg, representating the oil companies whose Mexican properties were expropriated, and President Cardenas have terminated without success, at least temporarily. Newspaper correspondents in Mexico City intimate that the question of managerial control was one of the chief obstructions to a solution.

Through attorneys, the oil companies made the final plea open to them under Mexican laws attacking the constitutionality of the expropriation law and the decree of President Cardenas seizing the properties. The companies have now taken every avenue of legal approach to upset the expropriation decree. The Mexican Supreme Court which heard the arguments on the final suit reserved decision, but little hope is held that a ruling favorable to the companies will be handed down.

The Mexican press department issued a statement that the oil companies' representative would return to Mexico the third week in April after reporting in the United States and attending affairs in Washington. In a statement issued on the discussions, lacking specific details upon which the proposed settlement was based, Mr. Richberg inferred that all conversations had been along the line of equitable percentage division of proceeds from future operations. The percentage division of future oil proceeds would provide for the compensation and amortization of all contributions, both past and future. Mr. Richberg's statement said:

"I have an understanding that the solution of the oil problem should be sought in an agreement between the Government and the oil companies, determining their future relations, which would be mutually satisfactory and would provide for:

"First, an acceptable division of all the proceeds from the sale of oil products to insure adequate compensation for the workers, appropriate revenues for the Government and a reasonable compensation for past and future contributions of funds, property and related services.

Second, the retirement or amortization during the period of the agreement of all capital contributions so that at the end of the agreement there would be no interest or claim of any kind against the industry in behalf of those who have contributed funds, property or related services to its development.

"I was convinced long before the present discussion began that any attempt simply to agree upon a valuation of the expropriated properties and a method of adequate prompt and effective payment therefor would be a waste of time, first because of controversies over legal issues and other bases of values which could not be compromised, second because the valuation of any oil property is a matter of extraordinary difficulty dependent on opinions which differ widely, and finally, because even an unacceptable plan of deferred payments out of oil production would mean that the oil properties must be maintained and developed through large additional contributions of funds, property and related services requiring continuing collaboration between the Government and those making past and future contributions.

"Therefore I undertook discussions on the assumption that, if an agreement upon future relations could be reached wherein a percentage of the proceeds of future operations would provide for the compensation and amortization of all contributions, both past and future, thereby we might avoid the insurmountable obstacles to agreement upon those legal and factual issues which would underlie property valuations and payments essential to a legal expropriation.

"In hereby summarizing my efforts and stating basic principles according to my individual opinion, I must make it clear that by courteous discussion neither party has committed himself to agreement with views expressed by the other and no agreement on any question is implied or can be assumed until such an agreement has been expressly stated by both."

In a speech at Mexico City Sunday that was plainly written and delivered for consumption by celebrants of the oil confiscation decree's first anniversary, President Cardenas expressed hope that the problem is "nearing solution." He said the Government was disposed to discuss partnership with the oil companies provided Mexico was assured of the lion's share of the management and profits. He said this submission of the details to technicians awaited only the companies' acceptance of Mexican principles. This acceptance was believed to mean the willingness to leave management at least partly in the hands of the Government. The companies have held out for a contract in which management would be exclusively in their hands.

The other paramount issue involved is the value of properties which would determine the term of the partnership contract in view of the principle that all operations would be turned back to the Government upon liquidation of the indemnity. Despite the mild optimism expressed by President Cardenas there remain deep seated differences between the Government and the private companies. A complete analysis of the findings of Mr. Richberg will be made upon his return to this country before decision is reached to enter the partnership or maintain the question in the hands of the Department of State.

What Germany Gains by the Seizure of Czecho-Slovakia

Nine petroleum refineries, approximately 145,000 bbls. annual crude oil production and territory consuming more than 2,000,000 bbls. of gasoline per year fell under German dictatorship as the result of last week's annexation of Czecho-Slovakia. A majority of the petroleum production and refining capacity were located in Slovakia which merely became a German "protectorate" in contrast to direct annexation of Bohemia and Moravia.

Accruing to the direct benefit of the Reich is the practically new refinery built by the former Czecho-Slovakian Government at Dubova, province of Slovakia, which was completed and placed on stream during the latter part of 1938. The government refinery which was placed under construction in 1935 consisted of a modern pipe still with fractionating equipment and was capable of processing approximately 2,000 bbls. of crude oil per day.

Approximately 70 per cent of the 145,000 bbls. of crude produced in Czecho-Slovakia in 1938, or about 101,500 bbls., came from the government-owned and operated field at Gbely in Slovakia. The only other production of any importance in what was formerly Czecho-Slovakia was obtained from the Hodonin field in southern Moravia, but was owned by the "Apollo" company, a private concern largely controlled by Dutch and French interests. Production of about 150 bbls. for the year 1936 was reported from the Mikova district in northern Slovakia.

One of the most modern refineries in what was Czecho-Slovakia is that of "Apollo" Rafineria Mineralnych Olejov Uc. Spol., at Bratislava where the company recently completed a cracking plant and installed a modern pipe still costing in the neighborhood of $500,000. The government refinery at Dubova cost approximately $1,000,000.

Socony-Vacuum Oil Co. subsidiary, Vacuum Oil Co. A.S., Prague, operates one of the other two modern pipe stills in the country at its refinery at Kolin and the other is in the plant of Fanto Werke, A.G. at Pardubice. The other six refineries falling under German "protection" were of comparatively little importance and represent not more than 20 per cent of the refining capacity combined.

Due to the operating relation between the Prussian mining company and Vacuum in Germany, it is not anticipated any serious interruption of the privately operated oil industry in the territory taken under "protection" by the Reich will result. Consequently, the net gain in the matter of petroleum for Germany appears confined to the 2,000-bbl. government refinery at Dubova and the annual production of about 145,000 bbls. of crude in the Gbely field.

Internal production of Czecho-Slovakian oil fields was sufficient to meet only about 20 per cent of the domestic requirements. Remainder of the petroleum and refined products were imported. During recent years a bulk of petroleum imported by Czecho-Slovakia came from Rumania. About 200,000 bbls. of crude annually have been imported in the past few years from Colombia and the United States supplied about the same amount. In 1934 and 1935, the United States shipped about 500,000 to 600,000 bbls. of crude, but this rate tapered off to less than half in 1936 and dwindled still more in the past two years. Practically all of the refined imports received in Czecho-Slovakia in recent years have come from Rumania and Poland, although the United States continues to ship a bulk of the lubricating oil requirements. During the past two years, the sales of mineral oils in Czecho-Slovakia were reported by the government control office of refineries in the following amounts:

(Figures in barrels)

	1936	1937
Gasoline	1,691,500	1,819,000
Kerosene	547,125	547,125
Gas oil	217,500	275,500
Lubricating oil	318,500	378,000

Germany acquired the Zisterdorf field in what was formerly Austria in the first move of its expansion program more than a year ago.

Pipe Line Activity

Launching marine line in California

Turner Valley Pipe Line Rate Hearing April 12

CALGARY, Alberta.—The McGillivray commission, after hearing evidence and argument in connection with Turner Valley pipe line rates, adjourned until April 12, when a rate for transportation of Turner Valley crude by the Royalite pipe line to Calgary will be submitted. Commission counsel, accepting 19 years as the life of the field with an actual probable lifetime of 27 years, suggested a rate of 7.9 cents per barrel; while counsel for the Royalite company estimated the field life under 15½ years with 10 years a fair basis, and asked continuance of the present 15-cent rate. The question of storage for other companies was also argued.

Lion Oil Refining Laying Line to Schuler Field

SHREVEPORT, La.—Lion Oil Refining Co. of El Dorado, Ark., is laying a 6-inch pipe line from its El Dorado refinery to the Schuler field of Union County, a distance of about 12 miles. The company already operates two lines from the field to the refinery.

Refinery Projects

Less Lubricants Were Exported From United States Last Year

World demand for lubricating oils and greases is directly proportional to industrial activity and is, therefore, a barometer of economic conditions. Decreased exports of these commodities during 1938 from the United States, the world's leading lubricant exporter, reflect the recent slackening of industrial activity throughout the world, according to the Bureau of Foreign and Domestic Commerce, Department of Commerce.

Foreign shipments of lubricating oils from the United States decreased from 10,839,000 bbls. in 1937 to 9,312,000 bbls. in 1938, a decrease of 1,527,000 bbls., or 14 per cent. The value of these exports in 1937 was $86,509,065, an average per barrel value of $7.98, while in 1938 the value of foreign sales of lubricating oil totaled $68,854,600, an average of $7.39 per barrel.

Foreign sales of lubricating grease decreased more than did foreign sales of lubricating oils, or from 102,001,800 pounds in 1937 to 77,286,000 pounds in 1938, a decrease of 24,715,800 pounds, or 24.2 per cent. The average value per pound of grease exported in 1937 was 4.6 cents compared with 5 cents per pound in 1938.

Talco Asphalt & Refining Co. Operating at Full Capacity

Contrary to reports that the Talco Asphalt & Refining Co., Mount Pleasant, Tex., is shut down, this plant has been operating at full capacity since January 1, 1939, manufacturing a full line of light oil and asphaltic products. The plant was temporarily down in December for three weeks for general inspection.

Anglo-Canadian Oil Co. Expanding Brandon Plant

BRANDON, Manitoba.—Rapid progress is being made with construction work on additions to the Anglo-Canadian Oil Co. central refinery here, and it is expected new installations, increasing the capacity from 750 to 2,500 bbls. a day, will be completed early in May. Storage capacity is also to be increased.

Ben Franklin Acquires Gathering System in Southern Oklahoma

Ben Franklin Refining Co. of Ardmore, Okla., has acquired the gathering facilities of Oklahoma Pipe Line Co. in the Seay, Oscar and Spring pools in Jefferson County, Oklahoma, and assumed operation of the system on Tuesday, March 21.

The Ben Franklin company announces that for the time being it will continue to take a maximum of 5 bbls. per well per day, which has been in effect since August 1.

The company posted a scale of prices for the three pools 14 cents per barrel lower than that of Carter Oil Co., which has been purchasing the oil and shipping through Oklahoma Pipe Line. The Ben Franklin price for 22-gravity oil is 60 cents per barrel, with 2 cents added for each degree up to and including 34 gravity and over at 84 cents. The schedule is on a 97 per cent tank-table basis.

It is said about 1,200 bbls. of daily allowable production is connected to the lines acquired by the Ben Franklin company, which announces that engineering work is in progress for an extensive redesigning of its refinery at Ardmore, including erection of a Dubbs cracking unit. When the work is completed, the company hopes to increase its oil purchases.

Standard of Indiana Will Take Surplus Oil From Nowata

Standard Oil Co. of Indiana has made an agreement with the National Refining Co. to purchase 1,750 bbls. per day of Nowata County, Oklahoma, crude oil at the market price plus gathering charge. The National Refining Co. posts the same prices in the field that the Standard of Indiana posts in the state generally. The action of the Indiana company saves the Nowata producers from a cut in price, as the National company had intended on March 10 to post a schedule based on the refinery price of 70-72 octane gasoline, but delayed action pending efforts to work out a relief plan. The action of Standard of Indiana made the change in price schedule unnecessary and will give Nowata operators the regular posted prices starting with below 21°, 70 cents; 21°-21.9°, 72 cents with 2 cents added for each degree upward to 40 and over at $1.10. The National Refining Co.'s pipe line will continue to gather the crude at the wells and will deliver it to Stanolind Pipe Line Co.

A.P.I. Panhandle Chapter Has Meeting at Pampa

PAMPA, Tex.—A crowd of nearly 1,000 attended the March meeting of the Panhandle chapter of the American Petroleum Institute, Division of Production, in the Pampa city auditorium. Chairman Walter Biery, gauger for Sinclair Prairie Oil Co., Pampa, presided.

Carbon black was the theme of the meeting with C. A. Carlton, Huber Carbon Co., the principal speaker.

The Cabot company of which R. G. Allen is general manager of the southwestern division with offices in Pampa, presented a moving, sound picture, "Inside the Flame," showing the company's laboratories and plants in the Panhandle and West Texas.

Second Test Started in Northwest Missouri

Two wells are being drilled in northwestern Missouri, six or more locations for other wells have been staked and within the next few weeks deals for several additional tests are expected to be completed.

J. H. Everitt and others No. 1 Spring, SW SE Section 30-62-38w, north of Mound City, Holt County, was reported to have had a showing of gas at around 308 feet and was drilling below 500 feet. Operators are withholding geological information. This was the first well to be started in the Missouri sector of the Forest City basin since the lease boom started last summer.

Eastern Drilling Co. and others No. 1 Williams, NW NW NE Section 28-53-32w, Clay County, the second well to be started in northwestern Missouri, was reported setting surface casing.

George Moore and associates of Joplin were reported moving in material at No. 1 McQuate, Section 11-57-31w, in DeKalb County, 1 mile north of the town of Osborn.

Controlled Gasoline Output Seen by Elliott Roosevelt

FORT WORTH, Tex.—Elliott Roosevelt in his broadcast Friday evening said:

"The plan of controlled production of gasoline has gained widespread support of oil men in recent weeks. It appears likely that it might be culminated in the near future. A bill before the Texas Legislature even now would extend to the Railroad Commission such regulatory power, in addition to the crude oil proration power already vested in it.

"Chief question besetting the refinery proration plan appears at this time to be whether it would have any effect on the importation of crude oil into Texas from Louisiana and elsewhere. This importation, chiefly from Louisiana and Illinois, threatens to become a major problem to Texas."

Natural Gas News

Indiana Gas Industry Annual Meeting

The Indiana gas industry, serving more than 350,000 Hoosier homes, will hold its annual convention at Fort Wayne May 8 and 9. The Indiana Gas Association has announced preliminary plans for the meeting, which will attract approximately 300 representatives of the gas companies and a number of outstanding speakers.

Dean H. Mitchell, Hammond, president of Northern Indiana Public Service Co., is president of the association; Paul A. McLeod, Public Service Co. of Indiana, vice president, and H. W. Thornburg, Central Indiana Gas Co., secretary-treasurer.

The convention will hear reports of association officers, including the president's address, Monday morning. R. S. Agee, sales promotion manager of the Association of Gas Appliance and Equipment Manufacturers, will speak on "The CP Range Program."

Monday afternoon will be devoted to sectional meetings for persons engaged in technical, accounting and sales activities. A report probably also will be made on the successful advertising program which the committee engaged in last year.

The convention banquet will be held Monday evening.

Because gas has been chosen as the fuel for cooking at the New York World's Fair, a speaker to be provided by the American Gas Association will speak on this subject Tuesday forenoon, along with a representative of Purdue University, from which a number of leaders in the industry were graduated. Other discussions will include personnel training, water heater sales, economics, and home heating.

Canada Western Seeking New Gas Fields

CALGARY, Alberta.—The annual report of the Canadian Western Natural Gas, Light, Heat & Power Co. supplying natural gas to Calgary, Lethbridge, and other southern Alberta communities, shows for 1938 gas sales totaling $2,152,537 with a net operating profit of $665,094, and earned surplus of $200,428. Gas sales were down $161,154 from the previous year owing to milder weather. The company lists total current assets of $1,137,977 and fixed assets of $16,165,960 with current liabilities of $279,439.

The company, in compliance with orders of the Alberta Conservation Board, has discontinued repressuring operations in the Bow Island field, carried on since 1930 with waste gas from Turner Valley. As a consequence of these operations, the pressure has been built up and a valuable emergency reserve established in the Bow Island field. Commenting on the conservation board's action, President H. R. Milner states: "If the gas can be retained in the structure and so serve the dual purpose of facilitating the recovery of oil and prolonging the life of Turner Valley as a gas field, this company should do everything in its power to assist the board."

The Canadian Western company is continuing its efforts to discover new gas fields in southern Alberta. A well was drilled on the Bearberry structure which, from a geological point of view, was promising, but a fault was encountered and the test abandoned. The company has interested itself at relatively small cost in the development of certain other structures which will be tested this year, the objective being to have the first call on any gas developed.

Western Pennsylvania Gas Diminishing Rapidly

PITTSBURGH, Pa.—The Peoples Natural Gas Co. contended at a Public Utility Commission hearing here that its rates were justified because western Pennsylvania's gas supply was gradually disappearing.

Ralph E. Davis, Pittsburgh geologist and engineer, told Examiner Harry K. Frank his survey of about 1,800 gas wells in nine southwestern counties showed well pressure dropped approximately 50 per cent since 1925 and reserves declined proportionately.

The company was one of 100 ordered by the commission to prove their rates were fair. George I. Rhodes, New York engineer, estimated the Peoples company property valuation at $63,836,000 June 30, 1938, and that of its affiliate, Columbia Natural Gas Co., $16,628,168. Peoples Gas had 121,000 consumers in 169 communities while Columbia had 23,000 in 71.

Gasoline Price Fixing Case to Privy Council

VANCOUVER, British Columbia.—Justice A. M. Manson has handed down a decision holding ultra vires the sections of the provincial Coal and Petroleum Products Control Board Act under which a government commission last October ordered a general reduction in the retail selling price of gasoline. He granted an injunction to nine gasoline distributing firms which brought suit challenging the validity of the act. It is expected the British Columbia government will appeal the case to the privy council.

Oklahoma City Wilcox Secondary Recovery

The operators in the Oklahoma City Wilcox pool have organized the Oklahoma City Wilcox Secondary Recovery Association, the purpose of which is to make a complete and comprehensive study of the Wilcox reservoir in the Oklahoma City field with the view of possible application of secondary recovery methods in this field.

C. V. Sidwell of Tulsa, formerly with the British American Oil Producing Co. at Oklahoma City, has been selected as chairman of the engineering committee. This committee is similar to pool engineering committees formed in Yates, East Texas, Goldsmith and the North Basin engineering committee in West Texas, except that this is probably the first engineering committee ever formed by operators to study a secondary recovery project.

Natural Gasoline

Tide Water-Seaboard Increase Condensate Operations

The Tide Water Associated Oil Co. and the Seaboard Oil Corp. of Delaware, partners in development in the Long Lake and Cayuga pools, Anderson County, announced plans for construction of a new extraction plant at Long Lake. The same partners announced completion of enlarged units on the year-old Cayuga plant, which was scheduled to resume operations on the enlarged scale on Tuesday, March 21.

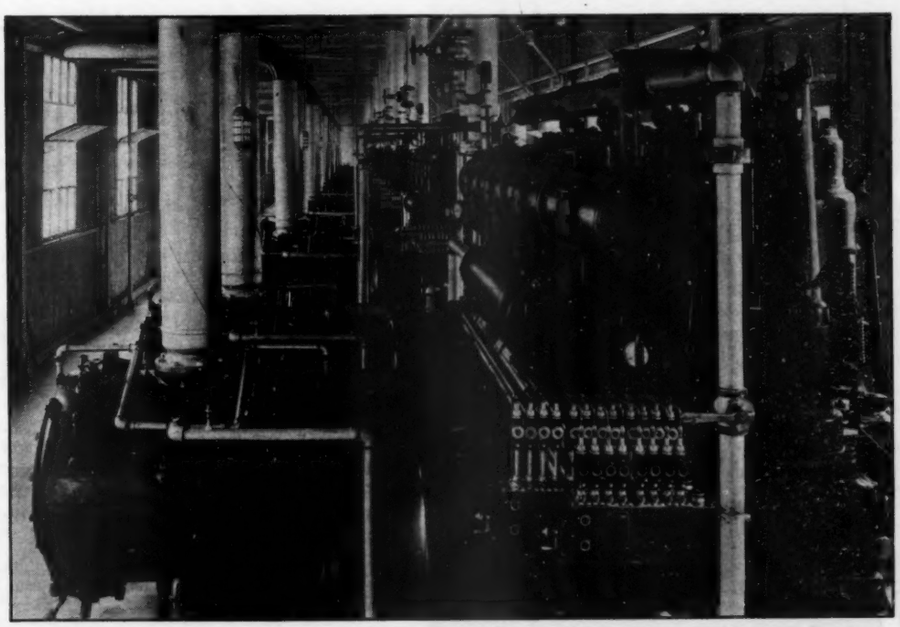
Contract for the proposed Long Lake plant was awarded to J. F. Pritchard & Co., engineering firm of Kansas City, which has had a corps of engineers at work on drafts for several weeks. The plant will be erected on the Shaw & Cern lease, in the Daniel Parker Survey. Clearing of site location is under way and work on the office building will begin during the week. The plant will be in operation within 90 days, according to the plans.

The proposed Long Lake unit will be the second plant built under specifications of the Vaughan Process, worked out by William H. Vaughan, who with J. C. Dennis, engineer, will supervise the construction.

The Long Lake unit will handle gas from an area of from 2,000 to 3,000 acres. It will have a capacity of from 25 million to 40 million cubic feet per day, with condensate production amounting to between 25,000 and 40,000 gallons daily. It will have compressor equipment of 1,000 hp., consisting of two 300-hp. and one 400-hp. angle-type units. Condensate will be extracted under extremely high pressure with the use of ammonia refrigeration; residue gas will be returned to the Woodbine reservoir. A stabilizer unit treats the raw product, and a rerun distillation device produces a finished product of a condensate of desired specifications, or a natural gasoline or motor fuel, as the market may demand.

The project will cost approximately $250,000 to $300,000 and will employ from 15 to 20 men.

The Cayuga plant will process around 25,000 gallons of condensate, as compared to around 10,000 gallons under the old set-up. It is using about 200 tons of refrigeration and will draw from 10 wells in the area. The plant represents an investment of approximately $250,000 and was the first built in East Texas.



Interior of F. W. Burford Co.'s natural gasoline plant in Miller County, Arkansas

Programs and Meetings

Petroleum Papers on Program Of A.C.S. at Baltimore, Md.

Chemists from industrial and educational laboratories will participate in a national symposium on "The Role of Catalysis in Petroleum Chemistry" to be held by the Division of Petroleum Chemistry of the American Chemical Society at Baltimore on Tuesday, April 4.

The symposium, to be held jointly with the society's Division of Industrial and Engineering Chemistry, is part of a three-day program on petroleum progress scheduled in connection with the ninety-seventh meeting of the society, according to the announcement by Dr. Per K. Frolich, research chemist of the Standard Oil Development Co., chairman of the division. Prof. Hugh S. Taylor of Princeton University will preside at the sessions on catalytic processes, which, it is declared, are of profound significance in the technology of oil refining.

A group of English chemists, consisting of S. F. Birch, A. E. Dunstan, F. A. Fidler, F. B. Pim, and T. Tait, representing the Anglo-Iranian Oil Co., will report recent research developments.

Papers to be presented before the symposium on the role of catalysis in petroleum chemistry follow:

Catalysis and Polymerization, by Robert E. Burk, Western Reserve University.

Alkylation of Hydrocarbons, by Gustav Egloff and J. C. Morrell, Universal Oil Products Co.

The Production of High-Octane Isoparaffinic Fuels by the Addition of Olefins to Isoparaffins, II, by S. F. Birch, F. A. Fidler, F. B. Pim, T. Tait, and A. E. Dunstan, Anglo-Iranian Oil Co.

The Catalytic Alkylation of Isobutane With Gaseous Olefins, by F. H. Blunck and D. R. Carmody, Standard Oil Co. (Indiana).

Catalytic Isomerization of Paraffin Hydrocarbons, by C. W. Montgomery, J. H. McAteer, and N. W. Franke, Gulf Research & Development Co.

Hydrocarbons and Their Isomerization, by Gustav Egloff, V. I. Komarewsky, and George Hulla, Universal Oil Products Co.

The Isomerization of Cyclohexane and Methylcyclopentane, by A. L. Glasebrook and W. G. Lovell, General Motors Corp.

Fundamentals in the Catalytic Ring Closure of Open Chain Hydrocarbons, by Hugh S. Taylor and John Turkevich, Princeton University.

Production of Aviation Fuels by High-Pressure Hydrogenation, by E. V. Murphree, C. L. Brown, and E. J. Gohr, Standard Oil Development Co. and Standard Oil Co. of Louisiana.

Evaluation by the Emanation Method of the Surface Area of Metallic Hydrogenation Catalysts, by I. D. Kurbatov, Universal Oil Products Co.

Dehydrogenation in the Petroleum Industry, by E. C. Williams, Shell Development Co.

The Catalytic Cracking of Aliphatic Hydrocarbons, by Gustav Egloff, J. C. Morrell, Charles L. Thomas, and Herman S. Bloch, Universal Oil Products Co.

The Catalytic Effect of Metals on Paraffin Hydrocarbons, by Charles L. Thomas, Gustav Egloff, and J. C. Morrell, Universal Oil Products Co.

The Suppression of Metal Catalysis in Gasoline Gum Formation, by F. B. Downing, R. G. Clarkson, and C. J. Pedersen, duPont & Co.

The Effect of Engine Metals on the Deterioration of Motor Oil, by F. B. Downing, G. E. Holbrook, and J. H. Fuller, duPont & Co.

Papers to be presented before the general meeting of the petroleum division at Baltimore, April 5 follow:

Catalytic Hydration of Olefins, by V. N. Shiffler, M. M. Holm, and L. F. Brooke, Standard Oil Co. of California.

Gum Formation in Cracked Gasolines, by D. L. Yabroff and E. L. Walters, Shell Development Co.

Gum Studies, I. The Formation and Composition of Pinene Gum, by Bernard Berger and R. W. Bost, University of North Carolina.

Structural Study of a $C_{16}H_{29}N$ Base From California Petroleum, by Stiles M. Roberts and J. R. Bailey, University of Texas.

Isolation of 2,4-Dimethyl-8-Ethylquinoline, 2,4-Dimethyl-8-*n*-Propylquinoline, 2,3,4-Trimethyl-8-Ethylquinoline, and 2,3,4-Trimethyl-8-*n*-Propylquinoline From California Petroleum and Proof of Structure Through Degradation and Synthesis, by W. N. Axe, R. A. Glenn, L. M. Schenck, and J. R. Bailey, University of Texas.

Acidic Constituents of a California Straight-Run Gasoline Distillate, by Kinney Hancock and H. L. Lochte, University of Texas.

Extraction of Mercaptans With Alkaline Solutions, by D. L. Yabroff, Shell Development Co.

Rapid Method for the Determination of Aromatic Hydrocarbons, by Aristid V. Grosse and Richard Wackher, Universal Oil Products Co.

Composition of Lubricating Oil. Properties of Lubricating Oil Fractions Separated by Distillation and by Extraction, by K. A. Varteressian, M. R. Fenske, and H. S. Smith, Pennsylvania State College.

Microviscometer, by John R. Bowman, Mellon Institute.

Efficiency of a Rotary Distillation Column, by Beveridge J. Mair and Charles B. Willingham, National Bureau of Standards.

Liquid-Vapor Equilibrium Relations in Binary Systems. Pressure-Volume-Temperature-Composition Relations in the Ethane-*n*-Butane System and Pressure-Volume-Temperature Relations for *n*-Butane, by W. B. Kay, Standard Oil Co. (Indiana).

The Determination of the Molecular Weights of Oils, by John R. Bowman and William E. Hanson, Mellon Institute.

Petroleum Accountants Society To Hear L. W. Scudder

The Petroleum Accountants Society of Oklahoma has arranged an outstanding program for its next monthly dinner meeting at the Mayo Hotel, Tulsa, 6 p.m. Thursday, March 30.

"Taxing Our Way to Prosperity" will be the subject of an address by Lawrence W. Scudder of Chicago, an economist, statistician, and accountant of note. Mr. Scudder is chairman of the board of the American Academy of Accountancy.

A. G. Wilmer, associated with Pure Oil Co. at Chicago, will address the society on "Application of Tabulating Machines to Federal and State Social Security Tax Work." Mr. Wilmer is a specialist in this work.

The Petroleum Accountants Society of Oklahoma represents a membership of 150, comprised chiefly of financial officers, comptrollers, auditors, and accountants holding supervisory positions in 46 oil companies. In its 12 years of existence this society has established a record of accomplishment in the oil industry.

An attendance of 200 members and guests is expected. Members of the Certified Public Accountants Society have been invited as guests.

East Texas Chapter A.P.I.

The next regular meeting of the East Texas chapter of the American Petroleum Institute, Division of Production, will be held in the Kilgore (Texas) High School auditorium at 8 p.m. Tuesday, March 28.

CALENDAR

March

SOCIETY OF EXPLORATION GEOPHYSICISTS, annual meeting (joint meeting with A.A.P.G. March 22), Oklahoma City, Huckins Hotel, March 21-23.

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS, 24th annual meeting, Skirvin Hotel, Oklahoma City, Okla., March 22-24.

April

AMERICAN CHEMICAL SOCIETY, Baltimore, Md., April 3-7.

AMERICAN PETROLEUM INSTITUTE, spring meeting of eastern district, Division of Production, William Penn Hotel, Pittsburgh, Pa., April 4-5.

AMERICAN PETROLEUM INSTITUTE, spring meeting of Pacific Coast district, Division of Production, Biltmore Hotel, Los Angeles, Calif., April 11.

NATIONAL PETROLEUM ASSOCIATION, semi-annual meeting, Hotel Cleveland, Cleveland, Ohio, April 13-14.

OIL BURNER INSTITUTE, fifteenth annual meeting, New York, April 18.

AMERICAN PETROLEUM INSTITUTE, Division of Production, Mid-Continent district, Skirvin Hotel, Oklahoma City, Okla., April 18-19.

OIL-WORLD EXPOSITION, Houston, Tex., April 24-29.

May

PETROLEUM ELECTRICAL SUPPLY ASSOCIATION AND PETROLEUM INDUSTRY ELECTRICAL ASSOCIATION, Rice Hotel, Houston, Tex., May 2-4.

NATURAL GASOLINE ASSOCIATION OF AMERICA, Hotel Tulsa, Tulsa, Okla., May 3-4-5.

AMERICAN PETROLEUM INSTITUTE, ninth midyear meeting, Roosevelt Hotel, New Orleans, La., May 15-18.

NATURAL GAS SECTION, A.G.A., annual meeting, Tulsa, May 8-11.

WORLD AUTOMOTIVE ENGINEERING CONGRESS, sponsored by S.A.E. for New York (May 22-26), Indianapolis (May 20), Detroit (May 31-June 2), San Francisco (June 6-8), May 22-June 8.

NATIONAL ASSOCIATION OF PURCHASING AGENTS, annual convention (Oil Company Buyers' Group), Fairmont Hotel, San Francisco, Calif., May 21-25.

June

ILLINOIS-INDIANA PETROLEUM ASSOCIATION, seventh annual conference, Robinson, Ill., June 3.

PENNSYLVANIA GRADE CRUDE OIL ASSOCIATION, Hotel Hershey, Hershey, Pa., June 15-16.

THIRTEENTH INTERNATIONAL CONGRESS OF CARBIDE, ACETYLENE, OXYACETYLENE WELDING AND ALLIED INDUSTRIES, Munich, Germany, June 25-July 1.

August

MICHIGAN OIL AND GAS EXPOSITION, Mount Pleasant, Mich., Aug. 1-6.

A.P.I. MEETING

(Continued from Page 25)

Refining Co., Houston, was elected secretary-treasurer and W. S. Morris of the East Texas Engineering Association, chairman of the advisory committee.

Members appointed to the advisory committee are:

E. H. Blum, Atlantic Refining Co., Dallas; Al Buchanan, Al Buchanan Drilling Co., San Antonio; A. R. Campbell, Mid-Continent Oil and Gas Association, Shreveport, La.; M. G. Chaney, Anzac Oil Corp., Coleman; Sid Childress, Rio Bravo Oil Co., Houston; J. D. Collett, O'Keefe & Collett Co., Fort Worth; A. J. Cunningham, Standard Oil of Texas, Houston; Charles Fitzgerald, Sinclair Refining Co. (pipe line department), Fort Worth; J. S. Ivy, Union Production Co., Houston; A. R. Wilson, Texas Co., Houston; T. E. Swigart, Shell Petroleum Corp., Houston.

C. L. Gladden, Magnolia Petroleum Co., Dallas; R. G. Hamaker, Reed Roller Bit Co., Houston; J. L. Hamon, Cox & Hamon, Inc., Dallas; J. S. Hasson, Ohio Oil Co., Shreveport, La.; C. W. Hughes, Arkansas Natural Gas Co., Shreveport, La.; R. B. Jones, Panhandle Refining Co., Wichita Falls; J. W. Jordan, Sinclair Prairie Oil Co., Midland; A. G. Levy, Fohs Oil Co., Houston; E. A. Landreth, Landreth Production Corp., Fort Worth; A. M. McCorkle, Stanolind Oil & Gas Co., Houston; R. S. McFarland, Seaboard Oil Co., Dallas.

J. R. McWilliams, Standard Oil Co. of Louisiana, Shreveport, La.; L. M. Moffitt, Triangle Drilling Co., Shreveport, La.; Gordon Richmond, Hughes Tool Co., Houston; J. A. Ritter, Sun Oil Co., Dallas; C. F. Roeser, Roeser & Pendleton, Inc., Fort Worth; A. H. Rowan, Rowan & Nichols Oil Co., Fort Worth; E. Ruebsamen, Trinity Drillers, Inc., San Antonio; J. H. Russell, Gulf Oil Corp., Houston; E. H. Salrin, Tide Water Associated Oil Co., Houston; J. R. Suman, Humble Oil & Refining Co., Houston; C. E. Sutton, Pure Oil Co., Houston.

Abstracts of technical papers not published in this issue are as follows:

PETROLEUM ENGINEERING EDUCATION AND ITS RELATION TO THE PETROLEUM INDUSTRY

By Harold Vance

Texas A. & M. College

Petroleum engineering is the application of engineering principles to the drilling, production, and transportation divisions of the petroleum industry. A number of educational institutions are offering courses which teach the engineering principles and the application of these principles to the above divisions of the industry. The National Council for Professional Development has accredited the petroleum engineering curricula in 11 institutions in the United States. Four-year courses do not give sufficient time for thorough training in the fundamentals, and to correct this condition, some institutions are offering five and six-year courses in petroleum engineering.

TRENDS AND DEVELOPMENTS IN A.P.I. PIPE STANDARDS

By C. A. Dunlop

Humble Oil & Refining Co., Houston, Tex.

A.P.I. pipe specifications are at the present time undergoing considerable change. Some of the changes are both revolutionary and evolutionary, and are of great import to the petroleum industry. The collapse strength of casing is an important factor to be considered when selecting long casing strings, and a series of collapse curves for pipe having tensile yield strengths ranging between the limits of 25,000 and 80,000 pounds per square inch and in intervals of 5,000 pounds per square inch will shortly be published. A somewhat radical change in the form of threads for casing and tubing and in the taper of threads for casing, 7-inch O.D. and smaller, is now in process as a result of dissatisfaction on the part of many operators with the performance under field conditions of the American standard (Briggs), three-eighths inch taper threads. Increased drilling depths have brought about the use of alloy steels having a higher minimum tensile yield strength than A.P.I. Grade D material for the manufacture of oil-well casing. This higher strength material is to be covered by specification in A.P.I. Standards 5-A, and a complete reclassification of the grades in casing and tubing is now being considered by the pipe committee. Simplification of casing sizes and weights is a matter of great importance to the industry, and changes in the listing of A.P.I. standard casing sizes with a view to effecting a saving in the cost of this item will be made in the near future.

APPRAISAL OF OIL PROPERTIES

By T. A. Hall

First National Bank, Dallas, Tex.

This paper presents an outline of the various factors which should be given all possible consideration in an appraisal of oil properties.

Changed development and production methods and regulatory control of production in the last few years have brought many new factors into appraisal estimates and made necessary the reweighting of the old factors. Of particular importance is the relative weighting of all factors for properties in prorated areas, where past performance may have no direct bearing upon future expectancy.

Special attention is directed to the numerous items which enter into the control of revenue and costs, as the worth of a property logically can be based only upon its net earning power.

Suggested forms are outlined for data compilation to meet the usual purposes of appraisals. These are considered particularly valuable as an aid in fixing property prices and terms because of the present day relatively low rate of investment return.

LOWER CANYON

(Continued from Page 33)

son well was not carried to the Palo Pinto lime but by interpolation it shows in excess of 300 feet of dip from the Griffin slightly east of south.

The Adams Branch lime is producing in Foard County and also in Haskell County. It has had showings in a number of places that were not acidized or properly tested.

The Palo Pinto lime is producing in Jones, Shackelford, Brown, Callahan, Runnels and Stonewall counties and had showings in Garza and Childress counties. In Runnels County the Beddo No. 1 Price is producing 15 bbls. of oil and 300,000 cu. ft. of gas. This is the southern extremity of known production in the Palo Pinto lime to date. In Childress County, the Alamo Oil Co. No. 1 Lowe encountered oil in the Palo Pinto at 5,653 feet. Six weeks were spent in trying to make a well and during this time it produced considerable oil but they were unable to complete the well so it was plugged and abandoned. T. C. Thompson, who was in charge of the geological work, estimates the amount of oil produced from 2,000 to 5,000 bbls. In Garza County, Palo Pinto lime was encountered in the Gulf well and made a good showing.

A line drawn from Runnels to Childress County is approximately 200 miles long. Palo Pinto lime is producing or has had good showings from Childress to Runnels County. Possibilities of production in the Palo Pinto extends west under the Planes country on the north and well into the Permian basin on the south. Production will not be of a blanket type but will be in small pools with a high recovery per acre. The discovery of these pools will depend first on surface structure which would include core drilling. Geophysical work will also be necessary and with present improvements and a better knowledge of subsurface conditions, it will become one of the important means of locating these pools. There are certain trends that will also limit the hazards of exploration. This area offers one of the greatest opportunities to the geological profession and is at the present time an unexplored province as far as Palo Pinto lime production is concerned.

NEXT YOU TURN TO THE A. A. P. G. SECTION

Relation Between Crude Oil and Product Prices

By SIDNEY A. SWENSRUD
Standard Oil Company (Ohio)

The relation between crude oil and refined product prices has long been a source of discussion within the petroleum industry and particularly since the inauguration of proration. When refined product prices have receded during times of oversupply or falling off in consumption, independent refiners have contended that they were the victims of the semifixed price of crude which did not similarly respond to the downward forces or at least not soon enough to avert serious trouble for refiners. Crude oil producers, on the other hand, tend to blame reduction in refined product entirely upon alleged mistakes within the refining branch and contend that if refiners would reduce their runs more effectively accumulation of surplus stocks would be avoided and prices would hold. In their view, refined prices should follow the price of crude and not vice versa, at least on the down side. The producers say that during times of reduced refinery prices, crude price reductions would merely cause further reductions in refined product prices and so on, until ruinous levels resulted. The other view is that refined price changes naturally occur ahead of crude price changes because of the more sensitive nature of the refined product markets but that changes in refined product prices are not a primary cause of changes in crude, or vice versa; rather both crude oil and product price changes fundamentally are the result of changes in the supply-demand relationships for the industry as a whole. There are, therefore, two main questions:

1. What are the facts as to the relationship existing, from time to time, between the price of crude oil and the value of the refined products produced therefrom?

2. What is the sequence in crude oil and product price movement?

A.A.P.G. **— Presented before annual meeting at Oklahoma City, March 23, 1939.**

Table 1 shows by years from 1920 through 1938 the average wholesale market value at the refinery of the products typically produced at Mid-Continent refineries from typical Mid-Continent crude. The yields of the different products were taken from the reports to the U. S. Bureau of Mines by refineries in the Oklahoma, Kansas, and Missouri; Texas inland, and Arkansas and Louisiana inland districts. To the yields of each product were applied the Oklahoma refinery wholesale prices for each product, these prices being obtained from the trade journal sources. The aggregate wholesale value of the refined products from a barrel of crude on the basis of the above-mentioned yields and prices are shown in the first column. In the second column is shown the average well price for each year of 36-gravity Oklahoma crude and the difference between the two (shown in the third column) is the amount available for getting the crude oil from Mid-Continent wells to Mid-Continent refineries and doing the refining job. (The detailed monthly data of the summary figures can be obtained from the author.) An example of the computations for the month of June, 1935, is as follows:[1]

TABLE 1

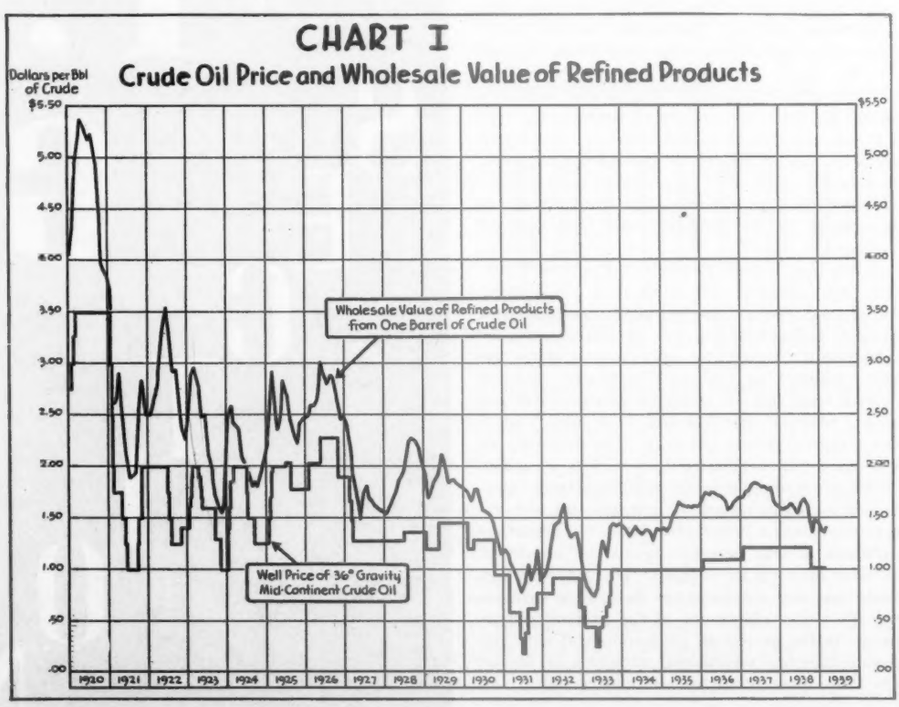
	Average wholesale value of typical refined products from 1 bbl. of Mid-Continent crude	Average price per bbl. of 36-gravity Mid-Continent crude at the well	Refining margin—Amount available for refining and crude transportation
1920	$4.74	$3.42	$1.32
1921	2.50	1.65	.85
1922	2.83	1.68	1.15
1923	2.21	1.56	.65
1924	2.12	1.64	.48
1925	2.52	1.87	.65
1926	2.69	2.13	.56
1927	1.80	1.38	.42
1928	1.94	1.31	.63
1929	1.87	1.37	.50
1930	1.58	1.23	.35
1931	.98	.63	.35
1932	1.30	.87	.43
1933	1.10	.62	.48
1934	1.37	1.00	.37
1935	1.55	1.00	.55
1936	1.69	1.10	.59
1937	1.76	1.22	.54
1938	1.56	1.18	.38

Product—	Yield—Per cent of crude	Yield—Gallons per bbl. of crude	Oklahoma wholesale refinery price per. gal.	Value
Gasoline	50.24	21.10	$.05625	$1.19
Kerosene	6.49	2.73	.0400	.1092
Gas and heating oils	9.82	4.12	.0325	.1339
Fuel oil and still gas	28.23	11.86	.016369	.1941
Miscellaneous	2.02	.85	.0230	.0196
Loss, etc.	3.20	1.34	....	....
Total	100.00	42.00	....	$1.65
Well price of 36-gravity Mid-Continent crude				1.00
Margin				$.65

In this paper the computations have been carried back on a monthly basis to the year 1920.

In Chart 1, the data for total refinery value of products produced from 1 bbl. of crude and the well price of 36-gravity crude are shown graphically by months from 1920 through 1938. Chart 2 portrays in graphic form the amount of the refining margin between the value of products and the price of crude.

The data presented in Table 1 and Charts 1 and 2 show how the value of products, the price of crude, and the refiner's margin have varied from time to time during the last 19 years. These years cover a wide variety of circumstances both as to the fundamental facts of supply and de-



[1]Approximately the same data were presented, beginning with the year 1928, in the July 18, 1938, issue of the National Petroleum News, Pages 25, 26 and 28.

mand of petroleum products and the degree of artificial control obtaining.

Nineteen hundred and twenty marked the close of the post-war period of extremely high prices both of crude and products. Nineteen hundred and twenty-one witnessed the discovery of important crude fields in Los Angeles which, together with the industrial depression of that year, changed the supply-demand situation for the petroleum industry rather suddenly. Thereafter, up to 1927, the industry was in a period of extremely rapid growth and rather wide fluctuation in crude oil and refined prices varying with the supply-demand situation. In 1927 came the discovery of the Seminole field and that year is usually assigned as the year in which proration began. So far as the question of artificial control of supply is concerned we may, therefore, consider 1927 as the dividing line between the period of free competition and the period when artificial restrictions of one sort or another were imposed. As may be noted from Chart 1, the average price trend has been downward throughout most of the whole period since 1920.

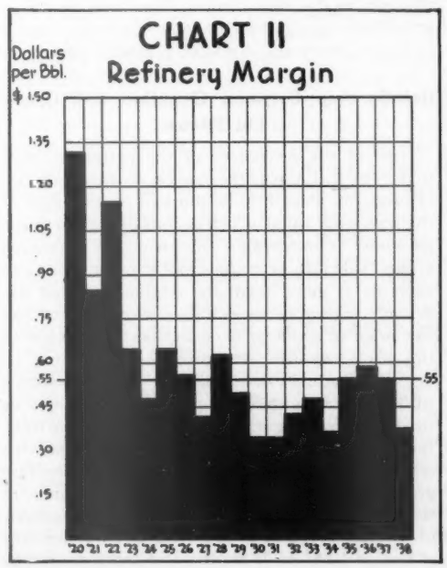
Less Interested in Price Trends

We are less interested here, however, in the question of the general price levels prevailing from time to time than in the relationship between the price of crude oil and the value of refined products. This relationship is best measured by the difference between the two values as shown in the third column of Table 1 and as set forth graphically in Chart 2. It will be noted that this difference, which we may refer to as the refining margin, has varied extremely from time to time—from a high of $1.32 a barrel in 1920 to a low of 35 cents in 1930 and 1931—from 59 cents a barrel in 1936 to 38 cents a barrel in 1938.

We do not know just what the costs are which must be covered by the margins in question—the operation consists of getting the crude from Mid-Continent wells to Mid-Continent refineries and doing the refining job to make the products indicated. Since the price quotations we are using are for refineries in the Oklahoma area, it can be assumed that the crude oil transportation is essentially a gathering operation in most cases, the cost of which, for the average refinery involved, would average around 10 to 15 cents a barrel. Refining expenses have doubtless increased during the period as the gasoline yield has risen and increased cracking operations have been involved and also as the quality of the gasoline produced has been improved. On the other hand, various economies in the use of fuel and the higher degree of automatic operation have been attained which should offset, to some extent, increasingly complicated processing operations. Wage rates, of course, have risen substantially. It has been estimated that at least 40 to 45 cents per barrel of crude probably has been required over the last eight or 10 years to cover the refining costs involved in making the products indicated. On this basis a total of around 55 cents a barrel on the average would seem to be a fair approximation of the total crude transportation and refining expenses involved. This does not assume the inclusion of a figure for interest on the investment which, as may be seen from the government figures in the footnote below, would add a substantial amount per barrel.[2]

On the basis of 55 cents a barrel representing the costs involved, it would appear that up to 1927 refining was a profitable activity, on the average, for each of the years shown but that during the period since the beginning of 1927, refining has been able to stand on its own feet on the basis of full posted crude oil prices, in only 3 out of the 12 years involved; namely, 1928, 1935 and 1936, although in 1937 the margin stood at 54 cents, or approximately at the break-even point. On the average, from 1920 through 1926, the refining margin was 81 cents a barrel. From 1927 through 1938 it was 47 cents a barrel.

An examination of the refining margin by monthly or by quarterly periods will reveal extremely sharp fluctuations from period to period, indicating the rapidity with which the refining situation can change as the relationship between crude oil and product prices shifts. A reduction in the refining margin has usually come about, in the first instance, through refined prices declining from earlier levels without a corresponding decline in the crude oil price. Of course whenever the crude oil price increases, the refining margin is narrowed but as we shall see presently, crude oil price changes usually follow product price changes, so that when a crude oil price increase takes place, it is usually after there has been some improvement in the refining margin.



[2] A report (No. 30) of the U. S. Tariff Commission, issued March 3, 1939, showed refining costs per barrel of crude as follows:

	1929	1930
Atlantic Coast refineries:		
Exclusive of interest	$.64	$.62
Interest	.11	.11
Total	.75	.73
Gulf Coast refineries:		
Exclusive of interest	.45	.49
Interest	.08	.08
Total	.53	.57
California refineries:		
Exclusive of interest	.26	.28
Interest	.05	.06
Total	.31	.34
Mid-Continent refineries:		
Exclusive of interest	.4317	.4779
Interest	.0597	.0647
Total	.4914	.5426
Ohio Valley refineries:		
Exclusive of interest	.5911	.6126
Interest	.0946	.1004
Total	.6857	.7130

The departmental figures submitted by the Humble Oil & Refining Co. to the so-called Cole Committee's petroleum investigation (see Page 2323, Hearings—House Resolution 441, 1934) showed refining losses in the years 1931, 1932 and 1934. During these years the refining margin, as shown above, was 35, 43 and 37 cents per barrel, respectively. For 1933, a profit before overhead expenses was shown—in that year the Oklahoma margin figure was 48 cents.

Sequence of Crude Oil and Product Price Changes

A careful examination of the relationship between crude oil and product prices indicates beyond a doubt that changes in product prices precede changes in crude oil prices and not vice versa. There has scarcely ever been a change in the price of crude, either up or down, which was not foreshadowed by a preceding change in the same direction in the wholesale value of the refined products. This may be seen in Chart 1. It will be noted, however, that the time lag of crude price changes behind product price changes is greater on the down side than on the up side. In other words, the crude oil price follows refined product price increases much more promptly than it follows price declines. An examination of the timing of Oklahoma wholesale gasoline price changes, for example, and Mid-Continent crude oil price changes since 1924 showed that on the average the crude oil price declined approximately six months after declines in gasoline prices had begun. During the same period the crude price increased on the average within three to

TABLE 2

Year—	Average Oklahoma wholesale price per gallon of regular grade gasoline	Average well price per barrel of 36 gravity Mid-Continent crude oil	Number gallons of gasoline required to purchase 1 bbl. of crude	Yield of gasoline from crude* (gals. per bbl.)
1920	$0.2124	$3.42	16.1	12.81
1921	.1377	1.65	12.0	13.90
1922	.1430	1.68	11.9	14.83
1923	.0992	1.56	15.6	15.41
1924	.0898	1.64	17.6	15.79
1925	.1057	1.87	17.0	17.05
1926	.1035	2.13	20.4	17.60
1927	.0672	1.38	21.0	18.06
1928	.0785	1.31	16.5	18.22
1929	.0759	1.37	17.5	18.04
1930	.0603	1.23	20.4	19.82
1931	.0358	.63	17.6	20.52
1932	.0477	.87	18.2	21.07
1933	.0380	.62	16.6	20.85
1934	.0460	1.00	21.7	21.01
1935	.0528	1.00	18.8	21.10
1936	.0588	1.10	18.7	21.16
1937	.0571	1.22	20.8	21.54
1938	.0500	1.18	23.7	†22.00

*Oklahoma, Kansas, Missouri; Texas inland; and Arkansas and Louisiana inland districts, as per Bureau of Mines reports. †Estimated.

four months after improvements in gasoline prices began.

Reason Why Crude Oil Price Changes Lag

It is not intended in the discussion above of crude oil and product price sequence to suggest that crude oil price changes are caused by product price changes. It is the writer's belief that the same causes are involved in both crude oil and product price changes for, except in a superficial sense, there is only one set of supply-demand factors in the oil industry in the United States; namely, the supply of crude oil and the demand for refined products. There is no demand for crude oil except to make it into products and no supply of products except crude oil—except in unusual cases, such as a sudden increased demand for a particular product in a quantity greater than can be manufactured at once (as appears to have been the case with gasoline during a part of 1928) or a sudden decline in demand for a by-product which it is difficult to discontinue manufacturing at once (such as the decline in the demand for industrial fuel oil in 1938).

As to whether the price of raw materials or their manufactured products, in general, tends to move first we do not believe any generalization for industry as a whole can be made; rather we believe it depends upon the nature of the markets involved. The price of iron ore changes very infrequently. On the other hand, the leading raw materials in the food and textile industries, namely, wheat and cotton, change from moment to moment in the great central exchanges where these products are traded.

So far as the petroleum industry is concerned, it is obvious, we believe, that the refined product markets are much more promptly sensitive to supply and demand than is crude oil, under ordinary circumstances. This was pointed out in the report of the Petroleum Code Survey Committee with respect to the N.R.A. period when the wholesale price of gasoline fluctuated up and down in a range of between 3.5 cents and 5 cents a gallon in response to rapidly shifting prospects for crude oil production control while the crude oil price itself remained unchanged throughout the period.[3]

[3]"While at all times since the code there has therefore been overproduction of crude oil as compared to the allocations, there have in addition been many intermediate changes in the outlook with respect to crude oil control. In February, 1934, for example, the Government's powers under the code were greatly reduced by the decision of Judge Bryant in the Panama and Amazon cases (see Exhibit I). In the week following his decision the wholesale price of gasoline in Oklahoma declined approximately .5 cent a gallon, which in terms of crude oil would be equivalent to 10 to 12 cents a barrel. In April new federal oil legislation was proposed and late in that month the Thomas-Disney bill was introduced, strongly backed by the administration and a large portion of the industry. There appeared little doubt that it would pass and that strong federal control would thus be restored. The price of gasoline reflected these changes in prospect, and from early April through May it rose approximately .75 cent a gallon. By the second week in June, however, it became evident that the Thomas-Disney bill would not be enacted. Here again was another shift in the outlook, and the price of gasoline, evidently reflecting it, declined in mid-June by approximately .5 cent a gallon. As the summer progressed the hot oil flow from East Texas increased and correspondingly the gasoline price structure steadily weakened. For a time a distinction was made in the price quotations between legal and illegal gasoline and the full effect of the hot oil and gasoline from East Texas can be understood only by examining the prices at which the hot gasoline was being sold.

"By the middle of October, however, even legal gasoline had sunk more than 1 cent a gallon from the midsummer level. Crude, however, still remained at $1 a barrel. Then late in October came the creation, under Section 9(c) of the National Industrial Recovery Act, of the Federal Tender Board which was set up to make effective the prohibition of interstate shipments of illegal crude oil and products from East Texas. The new board was successful immediately in drastically reducing such shipments. Here was perhaps the most definite example of all of a sudden change in the supply picture, and the gasoline price, sensitive to it, suddenly reversed its downward trend and advanced sharply for about two weeks, recovering from the extreme lows of October."—Report of Petroleum Code Survey Committee to Secretary of Interior Ickes, March 28, 1935.

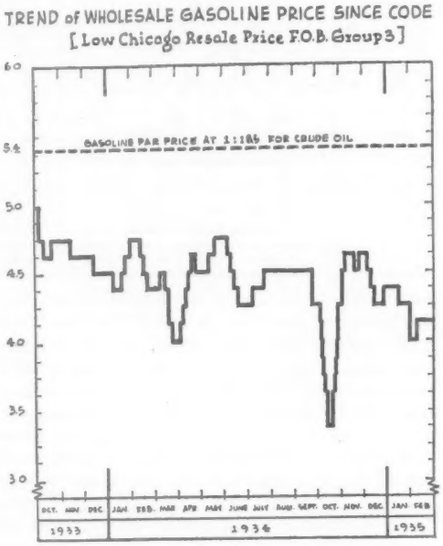


Exhibit 1

Clearly, the gasoline price fluctuations during that period were not primarily in response to the current rates of gasoline production or the stocks of gasoline on hand, which did not undergo any sudden or drastic changes concurrent with the price changes referred to.

The reason refined product prices are more sensitive is doubtless the fact that trading is continually going on in these markets and price changes occur in minute fractions of a cent per gallon. Many sellers meet or contact many buyers more or less continually, and there is no physical obstacle, such as a pipe line, to stand in the way of a buyer shifting from one source of supply to another or to hinder a seller from changing customers so far as wholesale transactions are concerned. Contrast this with the mechanics of the crude oil market where, under ordinary circumstances, buyers and sellers are closely associated together by pipe line connections. (Where this is not the case, as in a flush pool where oil is being shipped in tank cars, trucks, etc., crude oil prices frequently fluctuate widely over short periods.) These close physical connections between crude producer and purchaser make for delays in price changes because, in a competitive industry, price changes ordinarily come about through a buyer shifting or threatening to shift from one seller to another or vice versa. In the case of crude oil producers and purchasers bound together by pipe line connections, however, there is difficulty and inconvenience in producers shifting to new purchasers or purchasers shifting to new sources of supply. In other words, there is the element of inertia. Furthermore, so far as crude price declines are concerned, there is the fact that initiative ordinarily comes from the purchasers in that they usually post their purchase prices. For the buyer to cut the crude price is, therefore, to take upon himself considerable ill will, however justified his action might be from the standpoint of supply and demand. This is in sharp contrast to the impersonal nature of the similar transactions in connection with a commodity such as wheat or cotton, where there is no close physical or personal relation between the buyer and the seller.

These aspects of the crude oil price market explain, we believe, why it is a rather sluggish one in responding to changes in the supply-demand situation which have already been reflected in the prices of refined products. It must be admitted, however that they are hardly sufficient to explain the length of some of the time intervals between crude oil price changes in recent years, and we believe this tendency toward fixity must be partly attributed to proration rather than to the fundamental nature of the crude oil market.

We have already observed the way in which the wholesale gasoline price tends to reflect changes in the basic supply-demand situation for the industry as a whole. Generally speaking, it probably is safe to say that for the industry as a whole demand is the more stable part of the equation, the main fluctuations being in regard to the supply factor. Quite the opposite is true, however, as to heavy fuel oil which is essentially a by-product depending largely upon the rate of industrial activity for its demand. It is interesting to note the close relationship between the price of fuel oil and the rate of industrial activity. This may be observed in Chart 3 which compares the rate of steel mill activity with the price of heavy fuel oil in the Ohio Valley. The fuel oil prices are shown as a percentage of the average over a period of years and are from a private source.

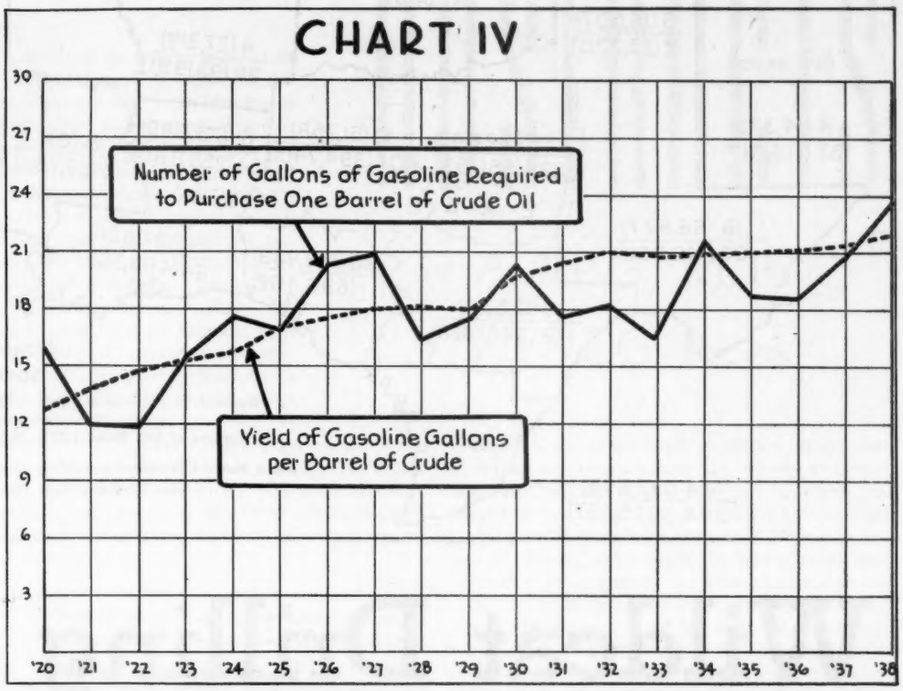
Relationship Between Gasoline and Crude Oil Prices

One of the provisions of the petroleum code under the N.R.A. was the suggestion that the price of crude oil should be established on the basis of the wholesale value of 18.5 gallons of regular grade gasoline. Considerable interest has centered around this idea ever since and it is interesting to examine in more detail the relationship that has actually existed between the price of crude oil and the price of gasoline over the period covered in this study; namely, 1920 through 1938. The average gasoline and crude prices by years are shown in Table 2. The gasoline prices are the same as used in the computation of Table 1, being the Oklahoma wholesale refinery prices of the gasoline which appears to have been the leading "regular" grade from time to time. In the third column at the right is shown the average number of gallons of gasoline required in each year to cover the cost at well of 1 bbl. of 36-gravity Mid-Continent crude.

It will be noted from the figures above and from Chart 4 that an increasing number of gallons of gasoline has been required to purchase 1 barrel of crude. To a considerable extent the reason for this, of course, is the fact that the gasoline yield from crude has been increasing as shown in Table 2 and Chart 4. In addition, however, it would appear that the phenomenon is a part of the general narrowing of the refining margin which has already been referred to.

What Is Reason for Narrowing of Refining Margin?

The purpose of this paper is primarily to present facts as to the relation between crude oil and refined products rather than to argue any particular thesis. It will be interesting, however, to mention briefly some of the explanations that have been suggested of the apparent tendency of the refining margin to be narrowed severely from time to time. One frequent suggestion is that refiners are prone to overproduce even though crude oil production and stocks are in apparent balance with demand. This theory may seem to presuppose, however, that refining is done by a different breed of people than are engaged in other parts of the industry, whereas in fact most refining is done by integrated companies in which refining is under the same general management as other branches. There is no question, of course, but that excessive stocks of refined products are a price-depressing factor. It may be questioned, however, whether any large excess of refined products generally does not indicate either a slowing down in demand or an increasing pressure of crude oil or both of these factors rather than purely a tendency of refiners to overrun for the sake of increasing their throughput. Certainly during most periods when there has been accumulation of refined product stocks, it could not be denied that one or both of these other factors has been present. It must be remembered that increasing pressure of crude oil for example, need not be always reflected in rising crude oil stocks. The fact that there is great excess capacity to produce a given product and a desire on the part of the owners of that capacity to utilize it is, we believe, sufficient to establish pressure of supply upon the market in the economic sense in which supply affects price. In the oil industry, the highly integrated character of a large part of the operation makes it possible for the pressure of crude to be exerted directly upon the refined product markets. Indeed if every oil company had all of its own production then, barring prices paid to royalty owners, there would be little occasion for changes in the crude oil price, for supply and demand would then be expressed almost entirely in refined product prices. This is somewhat the situation in the iron and steel industry where most of the important manufacturers have their own ore mines. Perhaps the increasing degree of integration in the oil industry is an important factor in explaining the narrowing of the refiner's margin; in other words, as a smaller proportion of the total crude production has "to go to market" in the true sense, on account of more refiners having their own production, the price may tend to become less realistic. For the integrated company having all or nearly all of its own production, it is essentially academic whether it makes a refining profit, as such, or not—its real interest is in the over-all margin between its crude oil production cost and its ultimate realization for all products. In establishing its refined product prices, therefore, it can ignore the posted price of crude if it chooses and consider only its production costs. This aspect of integration has been advanced as one of the reasons why the crude oil price appears to have become less responsivle to changes in the supply-demand picture than formerly and in all probability it has been one of the factors.



In somewhat the same connection, it is suggested that there is a tendency under proration and integration for the refining margin to narrow. The argument is that proration, being essentially a political mechanism, must undertake to maintain the crude oil price at a level high enough to satisfy the large number of independent crude oil producers, especially those who depend on settled or stripper production. Such a price level, however, is bound to be far above the actual production costs of the average barrel of crude and particularly of the additional crude which could be produced by particular companies anxious to increase the volume of their operations. As a result, such companies are willing to sell refined products on the basis of production costs considerably below posted price levels. And thus refined product prices are constantly being borne down to levels tending to correspond to production costs whenever these are below posted prices.

Relationship Among Various Refined Product Prices

There is a fairly close relationship between the price trends of the various refined products; that is, they generally move in the same direction at the same time although the proportionate amount of change varies substantially as among the different products. Kerosene, for example, tends to be more stable than gasoline and residual fuel oil prices less so. There have been a few occasions when gasoline has been increasing and prices of certain other products declining and vice versa, but over any length of time the price trends of almost all the refined products have generally been in the same direction. This is to be expected because within certain limits the proportions of the different products made can be varied somewhat. If one product is relatively high in price, refiners make every effort to make more of that product and less of others. Nineteen thirty-seven is an example of a year when a substantial improvement in the realization from products other than gasoline took place without any improvement in gasoline prices. This undoubtedly was because the high rate of industrial activity during most of that year created an excellent demand for fuel oil and other industrial products.

Summary and Conclusion

This study of the relationship between crude oil and refined product prices calls attention once more to the strong downward trend of petroleum prices and operating margins which has been going on for many years. In large part, it reflects the improvements that have been achieved in production, transportation, and refining, but it probably reflects, too, a tendency toward declining profits as the industry matures and the rate of growth lessens. The market value of the refined products of crude oil has, however, declined considerably more than the raw material itself. In the period since the beginning of 1927, the wholesale value of the refined products from a barrel of crude declined by an average of $1.26 a barrel as compared with the period from 1920 up to 1927. Between the same periods the price of crude declined by an average of 92 cents a barrel.

Thus it is apparent that the price relationship between crude oil and refined products has undergone a considerable change during the period covered by the study in that in the period since 1927 the products of a barrel of crude have shrunk by 34 cents a barrel more than has the posted price of the raw material from which they are obtained. It is to be borne in mind, also, that with the increased yield and quality of gasoline, the products of a barrel of crude today are relatively a more valuable combination requiring considerably more refining operations than the combination of products made in the early part of the '20s. So far as refining is concerned, there would seem to be nothing abnormal or alarming in the fact that the refining margin declines from time to time to unprofitable levels, for it is not the nature of the competitive system to permit comfortable and profitable operation to an industry all the time. It must be remembered that one of the functions of price is to act as a stimu-

(Continued on Page 159)

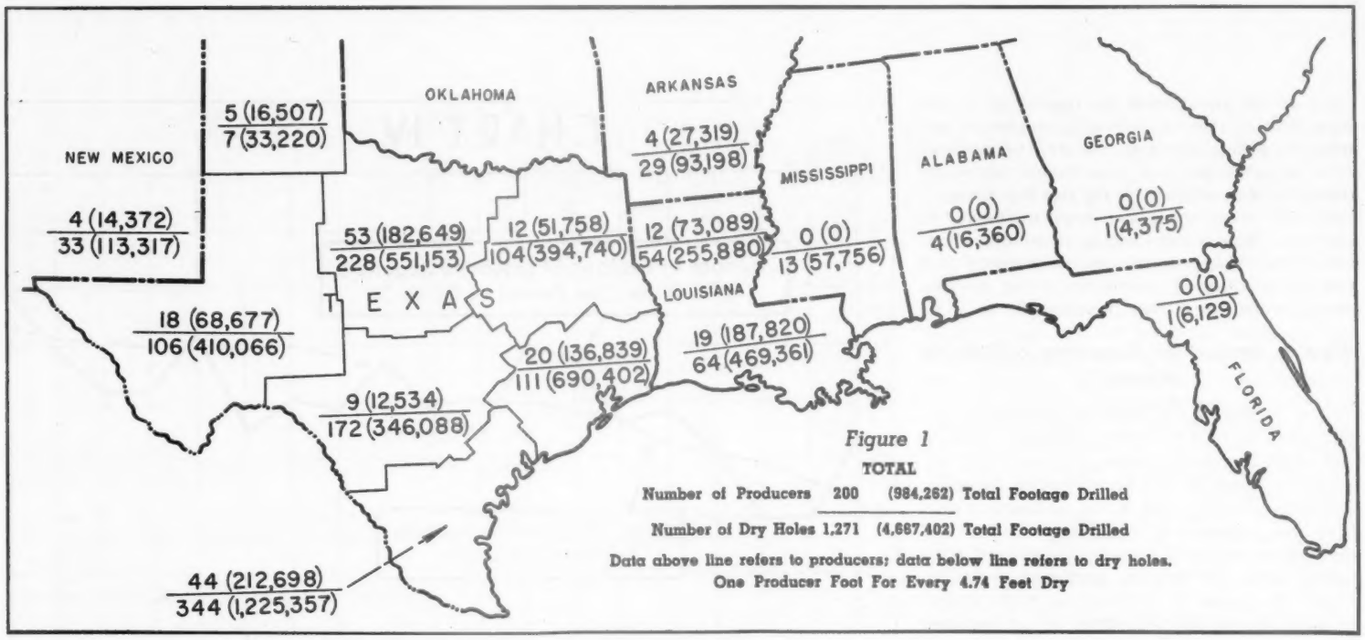


Figure 1

TOTAL

Number of Producers 200 (984,262) Total Footage Drilled

Number of Dry Holes 1,271 (4,667,402) Total Footage Drilled

Data above line refers to producers; data below line refers to dry holes.
One Producer Foot For Every 4.74 Feet Dry

Wildcat Drilling in 1938

By FREDERIC H. LAHEE

Chief Geologist, Sun Oil Co.

Before A.A.P.G. annual meeting, Oklahoma City, March 1938

This is a preliminary report on wildcat drilling in 1938. It covers only the states of the coastal plain area, from Texas and southeastern New Mexico to Georgia and Florida (Figure 1).

In compiling the data, we have tried as far as possible to adhere to the definition of a wildcat as a hole drilled completely outside the known boundaries of pools already developed, and far enough from producing areas to be essentially a test of new possibilities. Such a hole would usually be at least 2 or 3 miles from production; yet in some cases, notably in association with salt domes, a wildcat might be much closer to the edge of the known pool. The term would include all true discoveries of new pools, but not discoveries of new sands within old pools of which the structure and areal extent are known. However, the term would include holes finding new pay sands off the flanks of known producing structures and outside the limits of the known producing area, and also holes finding new pay sands on structures where very few producers had been completed.

On the accompanying map (Figure 1), figures in parentheses indicate total footage drilled; figures preceding parentheses indicate the number of holes drilled; figures above the cross line are for producing wells, both oil and gas; and figures below the cross line are for dry holes. In this area (Figure 1), during 1938, a total of 5,651,664 feet was drilled in 1,471 holes, divided as follows:

200 producers—984,262 feet.

1,271 dry holes—4,667,402 feet.

This means that 13.6 per cent of the holes drilled, and 17.4 per cent of the footage drilled was successful.

In our earlier reports on wildcat drilling in states of the coastal plain area,[1] data were not available on North Central Texas and the Panhandle of Texas, and consequently these districts were omitted in the calculations. In order to permit fair comparison of this year's figures with those of 1935, 1936, and 1937, we are similarly omitting these two districts of Texas from the totals mentioned below, unless they are specifically stated to be included. On this basis, then, during 1938, there were drilled 785,106 feet in 142 producers and 4,083,029 feet in 1,036 dry holes. The following table presents figures for the last four years:

	Producers drilled				Dry holes drilled				Total number wildcats drilled	Average depth of hole	Ratio number of dry hole feet drilled for each producer foot
	Holes		Footage		Holes		Footage				
	No.	Per cent	Feet	Per cent	No.	Per cent	Feet	Per cent			
1935	78	7.32	354,834	9.7	987	92.68	3,415,296	90.3	1,065	3,540	9.63
1936	116	10.67	527,286	12.8	971	89.33	3,585,676	87.2	1,087	3,783	6.80
1937	138	12.1	765,690	15.7	1,002	87.9	4,096,990	84.3	1,140	4,090	5.35
1938	142	12.0	785,106	16.1	1,036	88.0	4,083,029	83.9	1,178	4,132	5.21

This table shows a steadily increasing percentage of producers and of footage drilled in producers, and also a decreasing footage drilled in dry holes for every producer foot. It also reveals a steady increase both in the number of wildcat wells drilled each year and in the average depth per hole.

As for the reasons for drilling in 1938, 68 producers and 531 dry holes were located on geological information (surface, subsurface, trend, core drilling); 50 producers and 174 dry holes were located on geophysical evidence (seismograph, torsion balance, gravitymeter, magnetometer, resistivity); 10 producers and 36 dry holes were located on combined geological and geophysical evidence; 3 dry holes were located on other technical evidence; and 14 producers and 292 dry holes were located for nontechnical reasons (lease requirements, promotion, hunch, shows reported in old wells, etc.).

Of the holes located without technical advice, 4.54 per cent were producers, whereas 14.67 per cent of the holes located on technical evidence were producers. The fact that less than 15 per cent of the wildcats drilled on technical advice found oil or gas is significance of the uncertainties of geology and of the consequent difficulties of interpretation of available technical data. The impressive thing is that the holes located on technical advice were 3.23 times as successful as those drilled without such advice.

As a result of all this wildcat drilling, many new pools were discovered. Due to the fact that a new oil or gas well may eventually turn out to be an extension of an old pool, early classification of such new producers is not always correct, and records may vary. Thus, where the Oil Weekly[2] listed 106 new pools, our diagnosis indicates 96 new pools opened in 1938 in the area under discussion (omitting North Central and Panhandle Texas). But whatever classification is used, there were more pools found in 1938 than in 1937, and in 1937 nearly twice as many pools were discovered as in 1936.

Wildcat drilling is largely the industry's response to recommendations made by geologists and geophysicists. We are therefore particularly concerned with it, and rightly we view with pride the record of the last four years—(1) in-

(Continued on Page 146)

[1] Wildcat Drilling in 1935 and 1936: Bull. A.A.P.G., Vol. 21 (August, 1937), p. 1,079. Also Bull. A.A.P.G., Vol. 22 (September, 1938), p. 1,236. Wildcat Drilling in 1937: Bull. A.A.P.G., Vol. 22 (June, 1938) p. 645.

[2] Oil Weekly, Vol. 92, No. 7, Jan. 30, 1939, pp. 97-133.

ABSTRACTS

of A.A.P.G., S.E.P.M. and S.E.G. Papers

Wednesday Morning, March 22

SILVER GLADE ROOM, SKIRVIN TOWER HOTEL

(Joint Session with Society of Exploration Geophysicists and Economic Paleontologists and Mineralogists)

GENERAL TECHNICAL SESSION

9:30 A.M.—12 M.

Presiding: Donald C. Barton, R. W. Laughlin

1. REFORD BOND, Corporation Commission of Oklahoma.

9:30—Address of Welcome. 10 Min.

2. DONALD C. BARTON (President of the Association; Research Geologist, Humble Oil & Refining Co., Houston, Tex.).

9:40—Presidential Address: Correlation of Crude Oils With Special Reference to the Gulf Coast Crude Oils. 35 Min.

The pattern of this graph of the derivation-from-the-mean of the difference between the A.P.I. gravity of adjacent cuts in the U. S. Bureau of Mines Hempel analyses of crude oil is reasonably characteristic of the crude oil of individual reservoirs and is reasonably invariant in the face of drastice artificial oxidation and weathering. Wide variation is shown by the various crude oils of Texas, Louisiana, Arkansas, and Oklahoma. In many cases, the patterns for the crude oils or part of the crude oils from approximately the same or approximately equivalent formations will show mutual similarity which is very much closer than their resemblance to the patterns of other crude oils. Drastic difference is present in a few cases between patterns of crude oils from the same sand (examples: Woodbine, "Wilcox sand" of Oklahoma). The presumption seems justified that in general but not universally very close similarity in pattern indicates genetic relationship for the corresponding crude oils. The presumption is yet stronger that drastic difference in pattern necessarily indicates difference in origin or history for the crude oils in question. These patterns offer a usably good but not perfect means of studying the genetic relationships and nonrelationships of crude oils.

These conclusions are based on a rapid reconnaissance of the patterns for the Pennsylvanian and Permian crude oils of Texas, of the Oklahoma crude oils, and of the Cretaceous crude oils of Texas, Louisiana, and Arkansas, a few special detailed studies, and a detailed study of the patterns of Gulf Coast crudes.

The following theoretical conclusions seem to follow from the similarities and nonsimilarities of pattern and from a stratigraphic and areal occurrence of the Gulf Coast crude oils: The most common Plio-Miocene and younger Miocene crude oils cannot be migrant older oils. The older Miocene (post-Discorbis zone) crude oils and a group of "Oligocene" (post-Vicksburg) crude oils cannot be migrant oils of the most common Eocene and "Oligocene" types. Most of the source beds are decidedly limited in occurrence; and part of the variation in prolificness of adjacent structures is the effect of lensing in and out of the source beds. In spite of evidence against vertical migration at either place, some common factor producing similarity of pattern has affected crude oils through most of the Miocene section at Lockport, La.; and a similar factor has affected crude oils through all but the uppermost part of the Miocene section at Spindletop, Texas. Part of the similarity in pattern between crude oils of adjacent ages is the effect of persistence of similarity of source conditions over a period of time. This pattern holds reasonably invariant in face of variation of the base from naphthenic to paraffinic. This more detailed study of the Gulf Coast crude oils through their A.P.I. gravity patterns really is only an extremely rapid reconnaissance into a new field and it indicates great promise for further research.

3. E. H. SELLARDS (President of the Society of Economic Paleontologists and Mineralogists; Director of the Bureau of Economic Geology, University of Texas, Austin, Tex.).

10:15—Presidential Address: Some Vertebrate Fossils of the Texas Gulf Coastal Plain. 20 Min.

As the Cenozoic formations of the Gulf Coastal Plain of Texas of Oligocene and later age are nonmarine at their outcrop, they present difficulties in age determination. Several of these formations contain vertebrate fossils which give promise of supplying data on correlation. Collections of vertebrates are being made at the present time from the Pleistocene and Pliocene formations and will be made later from the Miocene and Oligocene. A locality yielding particularly good vertebrate fossils has been found in the Goliad formation in Bee County. The stream terrace deposits of the coastal plain contain an abundant Pleistocene vertebrate fauna. Vertebrate fossils by reason of the relatively short range of species are valuable for correlation purposes.

4. F. M. KANNENSTINE (President, Society of Exploration Geophysicists; Kannenstine Laboratories and Independent Exploration Co., Esperson Bldg., Houston, Tex.).

10:35—Presidential Address. The Relationship of Geophysics to Geology. 15 Min.

This paper defines geology and geophysics as applied to the oil industry, showing their related function in their past and present attempt to define the attitude of sedimentary beds. In reviewing geophysical methods it is pointed out that the reflection seismograph has thus far more nearly approached the mapping of subsurface structure as it actually exists than any other method. It is indicated that sedimentary basins in general are as closely and as highly faulted as the positive areas surrounding them. The detailed structure of many of these basins, however, is obscured by alluvium, glacial drift, continental deposits, or sedimentary beds of younger age than those from which production may be found. Since these areas enormously exceed those in which we have detailed information, there still remains a vast amount of exploration to be done. This creates a challenge for the improvement of methods and technique of structural mapping.

5. W. H. TWENHOFEL (University of Wisconsin, Madison, Wis.).

10:50—The Origin of Black Shales. 20 Min.

Explanations of origin are reviewed and environments in which black muds are in process of deposition are considered. The causes of blackness are examined and attention is given to diagenetic processes that take place in black muds.

It is concluded that colors of black muds are due to several components, of which some are developed in diagenesis and others are due to inclusion of organic matter of various kinds. Sediments that are black at the time of deposition may have the constituents to which blackness is due eliminated during diagenesis, or following lithification. These produce rocks that are not black. It is concluded that black muds develop under several environmental conditions, of which some are found in land waters, some in shallow marine waters, and probably some in deep marine waters, and the retention of blackness is dependent upon the extent of the micro-organic processes in the muds.

6. JOHN G. BARTRAM (Stanolind Oil & Gas Co., Tulsa, Okla.).

11:10—Summary of Rocky Mountain Geology. 30 Min.

The Rocky Mountain area of the western United States presents the most complete record on this continent of geologic events from Archean time to the present. Sediments from all the major periods are known somewhere in the region and the excellent outcrops have made possible their detailed examination. Many geologists have worked up there and the literature is vast.

This paper is an attempt to summarize it all and to present in 30 minutes a continuous story of geologic conditions and happenings in the Rocky Mountains from the pre-Cambrian to Recent. This will be done with a series of paleographic maps and cross sections, and the stratigraphy will be described more than the structure. Four major events controlled the geology of the Rocky Mountain area.

1. The formation, in Algonkian time, of the Cordilleran geosyncline which extended from Utah to British Columbia and persisted in that position through all geologic periods to the end of the Upper Cretaceous.

2. The extension in the Pennsylvanian and Permian of the Arbuckle-Wichita-Amarillo line of mountains into New Mexico, Colorado, Utah, and Wyoming and their subsequent erosion and burial under Triassic and Jurassic sediments.

3. The uplift in the Middle Triassic, of the Cordilleran landmass on the west and southwest which furnishes sediments from that direction

throughout the remainder of Triassic and all of Jurassic and Cretaceous time.

4. The extension eastward, at the close of the Upper Cretaceous, of the uplifted, folded, and faulted Cordilleran highland until the present Rocky Mountains were formed in the geosynclinal area and the sea was finally pushed from the interior of North America.

7. FRANCIS P. SHEPARD (Associate Professor, University of Illinois, Urbana; Research Associate, Scripps Institution of Oceanography, La Jolla, Calif.).

11:40—Tectonic Developments Off the California Coast. 20 Min.

A basis for contour maps of the tectonic provinces which border the California Coast was laid by the half million soundings taken in recent years by the United States Coast and Geodetic Survey. Investigations on the E. W. Scripp during the past year have greatly assisted the interpretation of the tectonic significance of these contours. The nature and possible times of fault movements in the Basin-and-Range province off southern California will be discussed. Also the structural implications in the complicated topography off the Monterey Bay area will be considered and the significance of a large fault scarp extending seaward off Cape Mendocino will be given attention.

PAPERS BY TITLE

8.* MALVIN G. HOFFMAN (Chief Geologist, Midco Oil Corp., Tulsa, Okla.).

The Role of Isostasy in Mountain Building.

Mountains are folded up by lateral compression but at the same time folded down several times as much as they are folded up. The downfolding is necessary to maintain a state of isostatic balance. Subsequent erosion of the mountain system is accompanied by periodic vertical uplifts. To reduce the area 1 mile it is necessary to remove 6 or 7 miles of rock.

This region may again become the site of deposition after base level has been reached. It is underlain by a segment which has experienced an increase in mean density and will be downwarped by lateral compression during a later stage of crustal collapse. Gradual sinking also may be produced by lowering of the isogeotherms which were raised during the period of erosion.

On the other hand, the area may continue its upward trend as a result of the formation of a magma underlying the mountain system. Removal of 6 or more miles of rock accompanied by a rise of the isogeotherms may be sufficient to initiate crystallization in the subcrustal tachylyte layer. Magnetic differentiation by fractional crystallization will produce a granitic liquid which has a relatively low density. The earth segment containing the magma will become a zone of very low resistance and be readily submissive to all stresses. Crustal elevations will be developed by stresses due to both isostatic adjustments and earth contraction. The magma will work its way upward by selective fusion, and vertical uplift brought about by isostatic adjustment to compensate for the removal of the overlying elevated portions of the crust.

Final solidification of the magma will convert this earth segment from one of erosion to one of deposition. Shrinkage will be caused by change from liquid to the solid state and the return to normal of the isogeotherms.

*Note—To be read before the Society of Exploration Geophysicists, Thursday afternoon, March 23, main dining room, Huckins Hotel.

9. T. C. HEISTAND (Consulting Geologist, I.T.I.O. Co., Bartlesville, Okla.), and P. B. NICHOLS (Geological Engineer, I.T.I.O. Co., Seminole, Okla.).

Drilling Time Data in Rotary Drilling.

T. C. Heistand

P. B. Nichols

Interpretation of Data, by Heistand

Evidence of the acceptance by geologists, engineers, and drillers on the Gulf Coast, in the Mid-Continent, and the Interior Coal basin, of the importance of complete foot-by-foot drilling-time records, has been shown in recent literature and discussions. This importance is pronounced due to the modern rig where rotary practice includes features of controlled weight on the bit, regulated rotary speed, maintained pressure, velocity, and consistency of the mud, as well as leak-proof tool joints and rock-bits designed and treated to penetrate each given formation efficiently. Accurate measurements are made from the cellar to the total depth. Since blowouts are less frequent the geologist must be able to determine positions of all producing zones drilled with improved technique at the well, whereas formerly discovery of "stray" producing formations often resulted coincidental with the blowouts.

Under proper conditions foot-by-foot drilling time is inversely proportional to the porosity of the formations penetrated. Fluids and gas are encountered in porous beds, and almost without exception where the drilling rate is abnormally high. The time record of each foot is needed in order to cease drilling and circulate samples from the uppermost few feet of a reservoir bed and to determine presence of oil or gas before any water is encountered. Coring or running drill-stem tester may then proceed advantageously. During coring the foot-by-foot time is needed; and in case several feet of dense formation is cored before soft beds are encountered the barrel is removed and emptied in order to get full recovery of underlying porous formation.

The data are correlated with changes in formation revealed by the cuttings to determine the relative sharpness or dullness of the bit in use. This interpretation insures a minimum time consumed by running on a dull bit.

Sample log from bottom of the hole to the surface is readily determined from this data, thus correcting tops and bottoms of all beds. This will confirm electrical logging, geothermal data, and other well surveys.

Determination of Data, by Nichols

The present method of recording drilling time is by means of an observer who notes the time and depth at given intervals. Usual procedure is to mark the "kelly" into equi-spaced segments varying from 1 to 5 feet depending upon the degree of control required. As these marks reach the rotary table, depth and time are recorded. The observer may be the geologist or engineer in charge. Some companies are requiring the contractors to furnish this information, in which case it is taken by one of the floormen under the supervision of the driller. Accuracy of this method is entirely dependent on the human element.

A recent innovation of the method of obtaining the drilling time is by means of an instrument known as the "Geolograph." This device automatically records the speed of drilling on a time chart along with such pertinent information as round trips, circulating time, shut-down time, etc.

In operation a flexible wire line is made fast to the rotary swivel, taken over a sheave about 50 feet above the derrick floor, down through the instrument and up again into the derrick where it passes over a second pulley and is kept taut by a weight suspended in a guide of tubing. As this line feeds through the machine in the various drilling operations the amount and direction of motion is transferred to the time chart. This machine was conceived by P. B. Nichols and developed in cooperation with the Indian Territory Illuminating Oil Co.

As only three of these machines have been manufactured to date it is yet too early to predict their entire field of utility. Accuracy of the Geolograph in indicating stratigraphic changes has been checked by cores and electrical logging and it is indicated that this instrument will be of value wherever the use of drilling time has proven beneficial.

Wednesday Afternoon, Mar. 22

SILVER GLADE ROOM, SKIRVIN TOWER HOTEL

PERMIAN SYMPOSIUM

1:30 P.M.—4:40 P.M.

Presiding: Ronald K. DeFord, Edgar Kraus

1. CARL O. DUNBAR (Professor of Paleontology and Stratigraphy, Yale University, New Haven, Conn.).

1:30—The Permian System. Its Classification and Correlation. 30 Min., Including Discussion.

An east-west section of the Upper Corniferous and Permian formations of the Permian basin west of the Urals shows the present classification and the stratigraphic-structural basis for drawing the base of the Permian below the "*Schwagerina* zone," that is, the zone of *Pseudoschwagerina*. The following points are to be stressed:

1. The Permian basin lies in large part on a foreland, the Russian platform, but includes as a narrow eastern border the western part of the Uralian geosyncline.

2. Middle Carboniferous (Moscovian) and Upper Carboniferous (zone of *Triticites)* extend across the platform and into the geosyncline without marked change of thickness or of facies.

3. Beginning with the Sakmarian (zone of *Pseudoschwagerina*) the geosyncline subsided rapidly and all the formations show a marked and rapid change of facies to detrital materials in the eastern sections. At Simskaya, the easternmost section studied, this change is initiated by limestone breccias of great coarseness, with *Pseudoschwagerina "princeps"* in the matrix and this is followed by "*Artinskian*" sandstones, siltstones, and shales of great thickness.

4. The "Upper Carboniferous" limestones of the Ufa Plateau for the most part grade laterally into the typical Artinskian.

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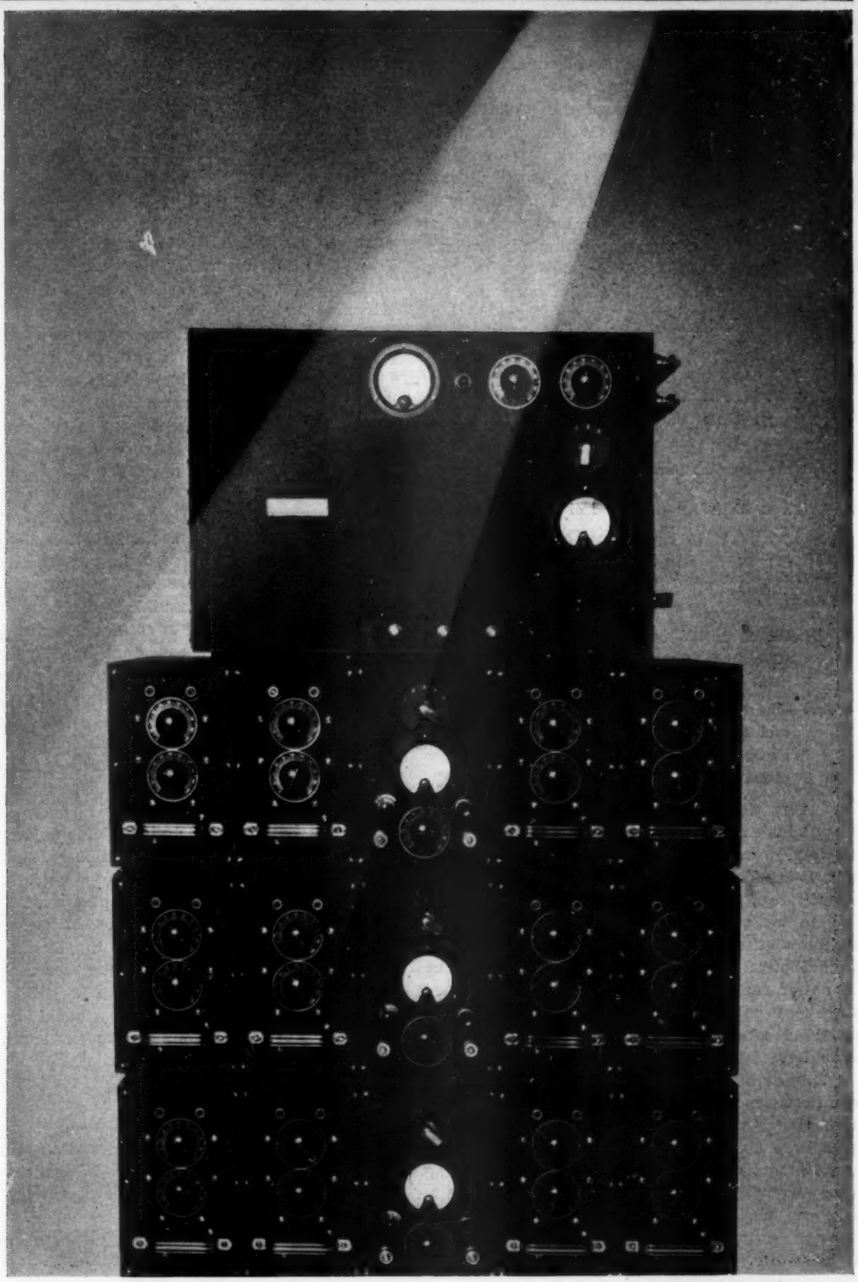

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5. The Sakmarian, Artinskian, the Kungurian series are chiefly developed in the geosyncline which was rapidly subsiding as the Ural range was rising.

6. By Kazanian time the uplift had spread westward to check the rapid subsidence in the trough and a great coastal plain of red sediments pushed back the sea that centered over the Russian platform.

7. By Tartarian time the sea had withdrawn, the geosyncline was being uplifted and nonmarine deposits spread widely over the platform.

8. The major tectonic developments in the Ural region that characterized the Permian period began before the deposition of the *Pseudoschwagerina* beds; the Sakmarian (Wolfcamp) is therefore a natural part of the Permian system.

9. A regional study of the same sort in South China and Indio-China indicates a big hiatus of regional extent immediately below the zone of *Pseudoschwagerina*, thus confirming the evidence in Russia and in the United States that the natural base of the Permian is at that horizon.

10. Correlations between these three regions are made.

2.* A. K. MILLER (Associate Professor of Geology) and W. M. FURNISH (Research Associate in Geology, State University of Iowa, Iowa City, Iowa).

By Title—Permian Ammonoid Zones.

3.* CARL O. DUNBAR (Professor of Paleontology and Stratigraphy, Yale University, New Haven, Conn.).

By Title—Fusuline Zones in the Late Paleozoic Systems.

4. ARTHUR A. BAKER and JAMES STEELE WILLIAMS (Geologists, Geological Survey, U. S. Department of the Interior, Washington, D. C.).

2:00—The Permian in Parts of the Rocky Mountain and Colorado Plateau Regions. 30 Min., Including Discussion. Published by Permission of the Director of the Geological Survey.

A very thick Permian section in the Wasatch Mountains east of Provo, Utah, has been disclosed by field work of the Geological Survey in 1937 and 1938. This section appears to have special significance, for it offers promise of providing a key to the correlation of the Permian sequence of the southern Rocky Mountains and the Colorado Plateau with that of the northern Rocky Mountain region. The correlations here suggested represent only tentative opinions and may be modified after the fossil collections from this area have been completely studied.

The Permian of southwestern Colorado and southeastern Utah consists of the Cutler formation (red beds), above, and the Rico formation (red beds and limestone), below, which overlies the Pennsylvanian Hermosa formation. In going westward across southeastern Utah and northeastern Arizona, it is found that thick light-colored sandstone tongues appear in the red beds of the Cutler formation. Still farther west at the Grand Canyon in Arizona the Permian rests upon the Mississippian Redwall limestone and consists in ascending order of the Supai and Hermit formations (red beds) overlain by the Coconino sandstone (light-colored, cross-bedded) with the marine Kaibab limestone at the top. The Supai, Hermit, Coconino, and at least part of the Kaibab are believed to be continuous with and essentially equivalent to the Cutler formation. The Permian sequence is unconformably overlain by Triassic beds—Moenkopi formation in southeastern Utah and northeastern Arizona and Dolores formation in southwestern Colorado.

The Permian deposits of western Wyoming, Idaho, northern Utah, and eastern Nevada have generally been designated the Phosphoria formation, but in northwestern Wyoming they are included in the Embar formation by many geologists; in northeastern Utah they are included in the Park City formation; and some Permian strata in parts of Wyoming have been included in the Chugwater formation.

In its typical region in southeastern Idaho, the Phosphoria consists of an upper chert and limestone—the Rex chert member— and a lower phosphatic shale member, between the Woodside shale of Lower Triassic age and the Wells formation of Pennsylvanian age. At the top of the Wells formation is a limestone generally thought to be of Pennsylvanian age. Where the Park City formation is recognized this limestone (or beds considered to be equivalent to it) is its basal member and is overlain by the phosphatic shales and upper cherty limestone that has been assigned to the Phosphoria formation farther north. The Park City formation has accordingly been considered by most geologists as in part of Pennsylvanian and in part of Permian age.

In the vicinity of Provo, Utah, a series of rocks with a maximum thickness of more than 4,000 feet is tentatively included in the Permian; it rests with probable unconformity upon a tremendously thick Pennsylvanian section and is unconformably overlain by the Lower Triassic Woodside shale. Limestone, from 0 to 1,400 feet thick at the base of the Permian, has no counterpart in lithology in the Colorado Plateau sections to the south nor in the sections of the northern province. An overlying red to gray sandstone 600 to 1,000 feet thick that is gradational with the underlying limestone is similar in lithology to the Coconino sandstone and is tentatively correlated with it. Overlying the sandstone is a formation nearly 2,000 feet thick, composed of a lower gray cherty limestone about 600 feet thick, an upper cherty limestone 600 to 1,100 feet thick, and an intervening black phosphatic shale about 200 feet thick. This formation is considered by the writers to be the equivalent of the Park City formation. The discovery in this formation of a fauna that has definite Kaibab elements beneath typical Phosphoria faunas and lithology, suggests that the Kaibab is, at least in part, equivalent to the lower limestone and that the phosphatic black shale and upper limestone may not be represented by contemporaneous deposits in the Grand Canyon region of Arizona. It also suggests that the fossils from the lower part of the Park City formation in neighboring regions should be restudied and its age assignment reconsidered.

5. GEORGE H. NORTON (Geologist, The Atlantic Refining Co., Wichita, Kansas.).

2:30—The Permian Red Beds of Kansas.

The Permian red beds of Kansas are restudied in detail with reference to Cragin's type sections and original classification, to which correlations have been made for 40 years. This paper enlarges on an unpublished paper, "Lower Red Beds of Kansas," abstracted in the Bulletin of the Association, Vol. 21, No. 12 (December, 1937), pages 1,557-58.

The Cimarron red beds begin above the gray, gypseous, fossiliferous, salt-bearing Wellington formation. Cragin's "Harper sandstones" are divided upward into four members; the *Estheria*-bearing Ninnescah shale, 425 feet thick; the Stone Corral dolomite-anhydrite, 0 to 6 feet (much more in subsurface); Chickaskia sandstone, 145 feet thick; and Kingman sandstone, 80 feet thick. These beds are part of the upper Garber, all of the Hennessey, and lower Duncan of northern Oklahoma.

Cragin's "Salt Plain measures," 275 feet thick, in few places well exposed, with "Cedar Hills sandstone," 180 feet thick, and overlying, selenite-veined "Flower-pot shales," 190 feet thick, are correlative with the Duncan and Chickasha of Oklahoma.

Cragin's "Cave Creek formation" is identical with the Blaine formation of Oklahoma, is 84 feet thick, and divided upward into four beds of gypsum: "Medicine Lodge," "Nescatunga," a bed in Cragin's "Jenkins clay," "Shimer" (Lovedale of Noel Evans), and Haskew. Where these gypsums are well developed only 15 feet of Cragin's "Dog Creek shales" separate them from the Whitehorse sandstone, but at the type locality, with the upper three beds absent because of solution, the separating clays to the base of the "Jenkins." have been included in the 53 feet of "Dog Creek shales," the highest unit of Cragin's Salt Fork division of the Cimarron series.

The Kiger division begins with the Whitehorse sandstone, a formation 265 feet thick, replacing Cragin's name "Red Bluff sandstone" (pre-occupied and dropped). It falls into four natural subdivisions or members: Marlow sandstone, 120 feet thick; Relay Creek dolomites with their included veined sandy shales, 22 feet thick, with local thin dolomites at middle and base, the last two being equivalent to the Rush Springs-Cloud Chief of Oklahoma, although Cloud Chief gypsums are not recognized in Kansas. No "channel sands" of the type Whitehorse facies of the Marlow have been noted in Kansas, although calcareous, cross-bedded sandstones are found associated with the Relay Creek dolomites.

Capping the Whitehorse sandstone, usually in a bold scarp, is the "Day Creek dolomite" of Cragin, a single bed of dense, commonly cherty, dolomite 2 feet thick. This bed in turn is overlain by gray and red shales ("Hackberry shales" of Cragin, name preoccupied, dropped) and "Big Basin sandstone," totaling 65 feet, previously combined under the latter name, which probably are correlative with the lower beds of the Quartermaster formation (restricted) of Oklahoma, these beds terminating the Kansas red bed exposures, with the possible exception of a small exposure in Morton County, not studied by the writer, which is mapped as Triassic by the Kansas State Geological Survey.

Possible horizons of unconformity have been studied critically, the evidence indicating nothing greater than local disconformity, the more pronounced stratigraphic abnormalities usually explained through removal of soluble beds by ground waters, resulting in slumpage and collapse-brecciation of the overburden, a condition to be expected of beds in contact with the major dolomite-anhydrite formations; the Stone Corral, the Blaine Dog Creek, and the Day Creek. The excellence of these evaporite formations as key horizons in red bed stratigraphy is emphasized in contrast with the variable lithology of the intervening red siltstones and their included lenses of orange-polished and micaceous sandstones, on which scant dependence can be placed, as shown on subsurface cross sections.

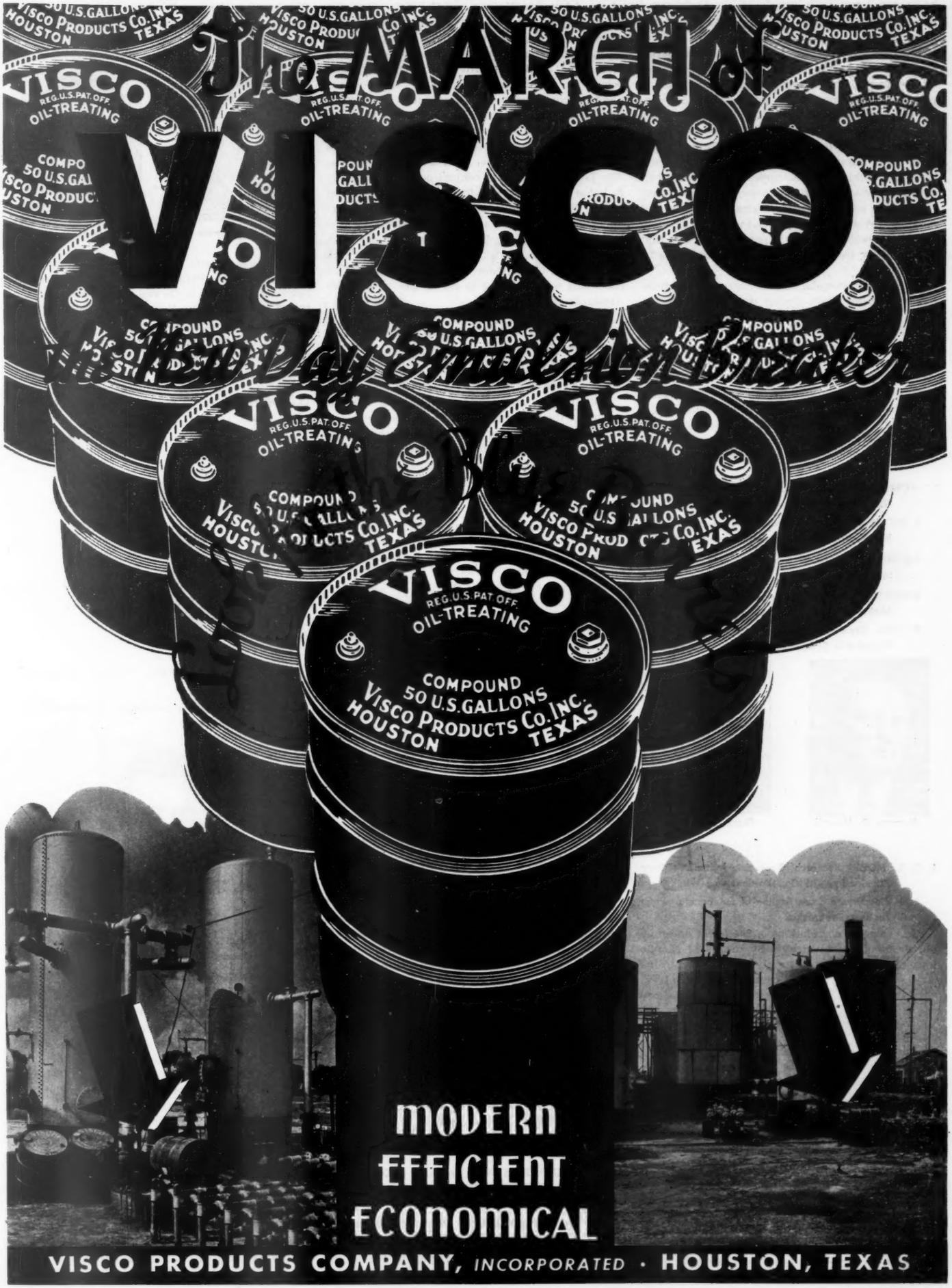
Cross sections depict a progressive wedging out of the various members of the Wellington and Harper formations against the Sierra Grande arch of eastern Colorado, where beds of approximate Salt Plain age rest on beds near the top of the Pennsylvanian (Wabaunsee) as accepted by the Kansas State Geological Survey, marking the one real unconformity of regional significance discovered.

6. SHERWOOD BUCKSTAFF (Geologist, Shell Petroleum Corp., Tulsa, Okla.).

3:00—The Permian Sediments of Oklahoma.

The Permian sediments of Oklahoma have been

*Note—Papers 2 and 3 to be read before the Society of Economic Paleontologists and Mineralogists, Thursday morning, March 23, Crystal Room, Skirvin Hotel. Titles listed here to show relation in symposium.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divided by Darsie A. Green into three series named Wanette, Minco, and upper Permian (unnamed).

The sediments of the lower and middle series range in composition from coarse deltaic clastics on the flanks of the depositional basin to saline precipitates in the deeper parts. Since no considerable unconformity or sharp change in sedimentation occurs in these strata, the boundary between these two lower series in Oklahoma and southern Kansas is defined as the Herrington limestone, which is the uppermost of the well developed lower Permian limestones in this area. Correlation with the Permian strata of Texas, and possible revision of nomenclature, will be suggested if discussions now in progress disclose that a reasonably close agreement of opinion can be obtained.

The upper Permian series is separated from the underlying strata by an unconformity of at least local importance, and is characterized by sediments deposited not by deltaic currents, but by marine currents traversing the basin. The lithology, distribution, and correlation of the strata in this series are discussed; the Marlow formation is recognized as an almost constant unit present over the entire area; various dolomites, gypsums, and breccia-conglomerates are interpreted as facies whose character is determined by their environment of deposition.

7.* NORMAN D. NEWELL (Assistant Professor Geology, University of Wisconsin, Madison, Wis.).

J. BROOKES KNIGHT (Curator of Paleozoic Invertebrates, Princeton University, Princeton, N. J.).

RAYMOND C. MOORE (University of Kansas, Lawrence, Kans.).

KENNETH BRILL (Graduate Student, University of Michigan, Ann Arbor, Mich.).

By Title—Invertebrate Fauna of the Late Permian Whitehorse Sandstone.

Norman D. Newell

Kenneth G. Brill

8. C. L. MOHR (Research Geologist, Indian Territory Illuminating Oil Co., Bartlesville, Okla.).

3:30—Subsurface Cross Section of the Permian From Texas to Nebraska.

The regional correlations of the lower and middle Permian are illustrated by means of sample logs of 20 wells lying nearly in a straight line from southeastern Irion County, Texas, to Phelps County, Nebraska. Two major disconformities, one at the base of the Wolfcamp and the other at the base of the Leonard, are traceable the entire distance. The lower of the two disconformities lies just under the lowest occurrence of the genus *Schwagerina* as recently redefined by Dunbar and Skinner and is correlated by the writer with the base of the Thrifty in Central Texas, the base of the Pontotoc in southern Oklahoma, and the base of the Admire in Kansas and Nebraska. The disconformity at the Leonard-Wolfcamp contact represents a period of erosion and a striking environmental change from marine to semimarine and saline conditions. An interesting transition occurs in the Leonard and lower Word equivalents from marine and limestones in western Texas through semimarine fossiliferous limestones, dolomites, shales, and anhydrites in West Central Texas to red beds, dolomites, anhydrites and salts in Oklahoma, Kansas, and Nebraska. The Leonard-Wolfcamp contact occurs immediately below the Elm Creek in Central Texas, on top of the Pontotoc in southern Oklahoma, and between the Herrington and the Winfield in Kansas and Nebraska. A local disconformity at the base of the San Angelo in Texas and the base of the Cedar Hills in the more northerly wells of Kansas seems to be missing in the deeper part of the Anadarko basin.

*Note—Paper 7 to be read before the Society of Economic Paleontologists and Mineralogists, Thursday morning, Crystal Room, Skirvin Hotel. Title listed here to show relation in symposium.

9. GEORGE A. KROENLEIN (Geologist, Midland Exploration Co., Lovington, N. M.).

4:00—Salt, Potash, and Anhydrite in the Castile Formation of Southeast New Mexico.

The Castile and Rustler formations have a combined thickness of 4,450 feet and compose one of the thickest evaporite sections in the world. Continual accumulation of concentrated saline water beneath the surface water in the Delaware basin raised the level of the concentrated water to the point where it caused epoch-making events in upper Permian history. Capitan reef building and associated petroleum deposition was stopped. The inflow of marine water diminished and deposition of evaporites in the Delaware basin started. This event marks the close of Capitan time and the beginning of Castile.

Subsurface study discloses many hundred feet of depositional relief on the basin floor near the end of lower Castile time. This condition is responsible for unsuccessful attempts to run a structural correlation across the Delaware basin on the base of the upper Castile (Main Salt). At present, potash is the mineral product of greatest economic importance in the Castile formation. Two mines are producing from some of the finest potash deposits in the world. A study of two subsurface cross sections shows many interesting features about evaporite sedimentation.

PAPERS BY TITLE

10. CLENON C. HEMSELL (Geologist, Columbian Fuel Corp., Amarillo, Tex.).

Geology of the Hugoton Gas Field of Southwestern Kansas.

The producing zones of the Hugoton gas area are correlative with the dolomite (lower Sumner) and dolomite and limestone (Chase group) of Permian age of Central Kansas. Between the Hugoton area and the Texas Panhandle gas and oil fields; the Wellington anhydrite (upper Sumner) is correlative with the top of the Texas Panhandle "Big lime"; the top of the Herrington (lower Sumner) is correlative with the "Brown dolomite" of the Panhandle "Big lime"; and the top of the Winfield limestone is correlative with the top of the "White dolomite" of the Panhandle "Big lime."

11. GARVIN L. TAYLOR and JOHN L. GARLOUGH (Geologists, Wichita, Kans.).

Geology of the Southwest Kansas Gas Area.

12. GLENN G. BARTLE (Dean, University of Kansas City) and RUFUS M. SMITH (Geologist, Panhandle Eastern Pipe Line Co., Kansas City, Mo.).

The Lakin-Hugoton-Guymon Area of Kansas and Oklahoma.

The stratigraphy of this region in the southwestern corner of Kansas and the Panhandle of Oklahoma is discussed briefly with especial emphasis on the members of the Big Blue series of the Permian system, Wreford to Herrington inclusive, which bear gas. Stratigraphic cross

Glenn G. Bartle

Rufus M. Smith

sections are given. A structural contour map of the entire district shows the location of more than 200 gas wells and the elevation of the top of the Herrington limestone in each.

Production statistics include the initial and present open flow and rock pressure and the total withdrawals to date.

13. HENRY ROGATZ (Consulting Geologist, Amarillo, Tex.).

The Geology of the Texas Panhandle Oil and Gas Fields.

Henry Rogatz

14. TAYLOR COLE (Geologist, University Lands, Austin, Tex.).

Heavy Minerals of the San Angelo Sandstone, Southern Midland Basin.

Taylor Cole

15. JOHN EMERY ADAMS (Geologist, Standard Oil Co. of Texas, Midland, Tex.).

Structural Development, Yates Area.

The market Cretaceous surface structure in the Yates area in eastern Pecos County, Texas, was developed by salt solution rather than folding. The solution was active in two stages. In the first, salt was removed from the crest of the dome and the hole left by this solution was filled with clastics. Cretaceous beds were laid down flat over this clastic plug. Post-Cretaceous solution developed a ring syncline around the plug and produced the present surface structure.

16. C. E. NEEDHAM (Professor of Geology and Paleontology, School of Mines, Socorro, N. M.).

Structural Evolution of the Rio Grande Depression Near Socorro, N. M.

The rocks in the Rio Grande depression and its borders in Central New Mexico range in age from pre-Cambrian to Recent, with no representa-

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tives of the Cambrian, Ordovician, Silurian, Devonian, or Jurassic. Disconformities or slight nonconformities, separate the Mississippian and Pennsylvanian systems; the Pennsylvanian and Permian; the Permian and Triassic; the Triassic and Cretaceous. Probably at the close of the Cretaceous, or early in the Tertiary, compressional stresses from the west lifted close folds, some of which are overturned, and at least one prominent zone of overthrusting is known. This was followed in Miocene time by intense volcanic activity. Continued deformation resulted in the formation of basins, one of which near Socorro was filled with fanglomerate to a thickness of 3,000 to 5,000 feet. This great thickness of clastic sediments was faulted and highly tilted, probably in late Miocene time, then deeply eroded. Another period of deformation during the Pliocene formed a series of basins which were filled with fan and playa deposits (Santa Fe formation). At the close of the Pliocene, or early in the Pleistocene, renewed faulting took place, blocking out the main trends and border features of the present basins along the Rio Grande. These faults are of the normal type, with their greatest throw toward the valley, thus developing the depression into a great complex graben structure. The Pleistocene was mainly a time of denudation, with enough changes in base level, however, to permit the cutting of a series of pediments. Crustal disturbances at the present time make this region one of the most active earthquake belts in the United States.

17. PHILIP B. KING (Associate Geologist, Geological Survey, U. S. Department of the Interior, Washington, D. C.).

Older Rocks of the Van Horn Region, Texas.

Thursday Morning, March 23

SILVER GLADE ROOM, SKIRVIN TOWER HOTEL

MID-CONTINENT-PENNSYLVANIAN SESSION

9 A.M.—12 M.

Presiding: N. W. Bass, Joseph L. Borden

1. ROBERT H. DOTT (Director, Oklahoma Geological Survey, Norman, Okla.).

9:00—Regional Stratigraphy of the Mid-Continent Area. 30 Min., Including Discussion.

This paper discusses the distribution and correlation of pre-Cambrian, Paleozoic, and Mesozoic rocks in North Texas, North Louisiana, Arkansas, Oklahoma, Kansas, Missouri, Iowa, and Nebraska. Outcrops of rocks belonging to each system are shown on a series of maps, together with pertinent subsurface data. Correlations of the larger units are shown in a series of charts. The data were compiled almost entirely from the literature.

2. IRA H. CRAM (Division Geologist, The Pure Oil Co., Tulsa, Okla.).

9:30—Regional Structure of the Mid-Continent Area. 30 Min., With Discussion.

In order to understand the regional structure of that part of the Mid-Continent area in which Pennsylvanian rocks are exposed, it is necessary to understand the geology of a much broader area, particularly the geology of the area embraced by 30° and 45° North latitude and 91° and 106° West longitude. The writer discusses briefly first the more important structural features of this area that are revealed at the surface. The regional subsurface structure is portrayed by a map contoured at 1,000-foot intervals on the top of the Arbuckle limestone (Cambro-Ordovician) or equivalents. A map showing the present distribution of pre-Pennsylvanian formations or groups of formations explains further the present structure of the Cambro-Ordovician. A cross section through Township 7n, Oklahoma, is considered a "hand specimen" of Mid-Continent structure. The more important periods of movement responsible for the present structure of the Cambro-Ordovician are discussed. The writer in conclusion points out that the entire area had the same structural history and that to understand thoroughly the structural history of any part of the Mid-Continent is to understand the structural history of the entire area.

3. THOMAS A. HENDRICKS (Geological Survey, Washington, D. C. Published by Permission of the Director of the Geological Survey).

10:00—Geologic Interpretations of Gravity Anomalies in Atoka and Bryan Counties, Arkansas. 30 Min., With Discussion.

Within the last few months a number of gravity observations were made by the U. S. Coast and Godetic Survey in Atoka and Bryan counties, Oklahoma, at the request of the Geological Survey, U. S. Department of the Interior. The stations lie both north and south of the southeastward projection of the fault that forms the north boundary of the Tishomingo granite of the Arbuckle Mountains. They also lie both northwest and southeast of the southward projection of the Choctaw or Ti Valley-Choctaw fault of the Ouachita Mountains. The gravity observations were desired for the purpose of testing the possibility of securing data on the concealed portions of the two faults. The computations are not yet completed (February 1).

4. CHARLES E. DECKER (Professor of Paleontology, University of Oklahoma, Norman, Okla. Presented by Permission of the Director of the Oklahoma Geological Survey).

10:30—(1) Basal Sedimentary Formations in the Wichita Mountains. 20 Min., With Discussion.

There is a great variation in the nature of the formations and the position of the contact with the igneous rocks beneath. Not only is this igneous - sedimentary contact a variable one with marked overlap at some places, but at a new and unmapped outcrop, more than 90 feet of limestone lie beneath the Reagan sandstone on the igneous rock and contain igneous fragments up to 30-40 feet above the base. Some calcareous algae occur in the basal part of this limestone. Sections and pictures will be shown to illustrate these conditions and samples will be displayed.

(2) Carbonaceous and Asphaltic Material in the Lower Arbuckle Limestones of the Wichita Mountains.

Carbonaceous shaly limestones with many fucoids occur in the lower Arbuckle limestones of the Wichita Mountains. In two of the quarries of this zone semifluid asphalt occurs in the joint cracks of the limestone and this material is thought to be indigenous to the formation. Specimens will be exhibited.

5. KENNETH K. LANDES (State Geologist and Assistant Director, Kansas Geological Survey, Lawrence, Kans.).

10:50—Oil Production from Pre-Cambrian Rocks in Kansas. 30 Min.

A few wells on the Central Kansas uplift are producing from pre-Cambrian rocks. The occurrence of oil in commercial quantities in rocks of this age is unique. The producing wells are in the Orth pool of Rice County and in the Gurney and Hall pools of Russell County. The pre-Cambrian rock in the Orth pool is quartzite, in the Russell County pools, granite. The latter consists of unweathered pink feldspar, quartz, and biotite. It is in place, and not granite wash or even residual soil derived from granite. The only porosity conceivable in such a rock is that which would be caused by fissuring. It is suggested that the oil migrated into cracks near the top of the pre-Cambrian rock from topographically lower basal conglomerate which laps up on the flanks of the granite hills.

6. N. WOOD BASS (Geological Survey, Tulsa, Okla.) and HAROLD M. SMITH (Bureau of Mines, Bartlesville, Okla.). Published by Permission of the Director of the Geological Survey and the Director of the Bureau of Mines, Department of the Interior, Washington, D. C.

11:20—Relationship of Crude Oils From the Mississippi Lime and the Shoe-String Sands of the Cherokee Shale in Osage County, Oklahoma, and a Part of Southeastern Kansas. 30 Min., With Discussion.

Harold M. Smith

N. Wood Bass

An investigation of the character of the oils from several producing zones in Oklahoma has been made during the past four years by a committee of the Tulsa Geological Society acting as a subcommittee of the research committee of the American Association of Petroleum Geologists. The members of the committee are L. Murray Neumann, chairman, T. F. Newman, Charles Ryniker, and N. W. Bass, geologists; R. L. Ginter, S. F. Mauney C. M. Richardson, and H. M. Smith, chemists. This paper, the first part of which was prepared by Smith and the second part by Bass, describes the results of the portion of the investigation that was made in Osage County, Oklahoma, and parts of Cowley, Butler and Greenwood counties, Kansas. A total of about 75 samples of crude oil were examined.

The following methods have been used in the past by other investigators to show the relationship of crude oils: (1) Comparisons of the A.P.I. gravities, (2) comparisons of the percentages of the products that are distilled off at definite temperature intervals, and (3) the intervals be-

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tween the gravities of the products that are distilled off at definite temperature intervals. Several features in each of these methods make them unsatisfactory as a basis for comparing crude oils. In the present investigation crude oil analyses made by the Bureau of Mines Hempel method were compared by the correlation index method, recently developed by Smith. This method employs a simple index number whose derivation is based on the boiling point-specific gravity relationships of pure hydrocarbons. The correlation index as used in studying a Hempel analysis is a number whose magnitude indicates certain characteristics of a fraction distilling at definite temperature intervals. The character of an oil may be shown graphically by plotting the indexes for the entire series of distilled fractions. The correlation index method appears to represent oils more truly than any of the other methods used heretofore.

The oils examined in this investigation occur in four stratigraphic zones, which are, in ascending order, (1) the Mississippi lime, which in a few places includes the Burgess sand that lies on the lime, (2) the lower Bartlesville sand, (3) the Bartlesville sand, and (4) the Burbank sand. The investigation showed that the four zones contain three kinds of oils. The lower Bartlesville oil is clearly of a different type from the Bartlesville, Burbank, and Mississippi lime oils. The Bartlesville and Burbank oils are of one general type but are sufficiently different from each other to make their differentiation possible. The Burbank oil is distinctly more paraffinic than the Bartlesville oil. The Mississippi lime oil in Osage County, Oklahoma, is like the Bartlesville oil, and the Mississippi lime oil in Butler County, Kansas, is like the Burbank oil.

The facts disclosed by the investigation led to the following tentative conclusions: (1) The oils from the lower Bartlesville, Bartlesville, and Burbank sands probably were derived from marsh and near-shore sediments that were deposited during three separate stages of the Cherokee sea, during which stages the sands also were deposited. (2) The oil from the Mississippi lime in Osage County, Oklahoma, was derived from the same sediments as the oil in the Bartlesville sand; the main oil pools in the Mississippi lime in Osage County are in contact with the source sediments, but some oil has migrated southeastward several miles through the uppermost porous zone of the Mississippi lime.

7. H. S. McQUEEN (Assistant State Geologist, Missouri Geological Survey, Rolla, Mo.). Published With the Permission of the Director of the Missouri Geological Survey.

11:50—Geology of the Forest City Basin. 30 Min., Including Discussion.

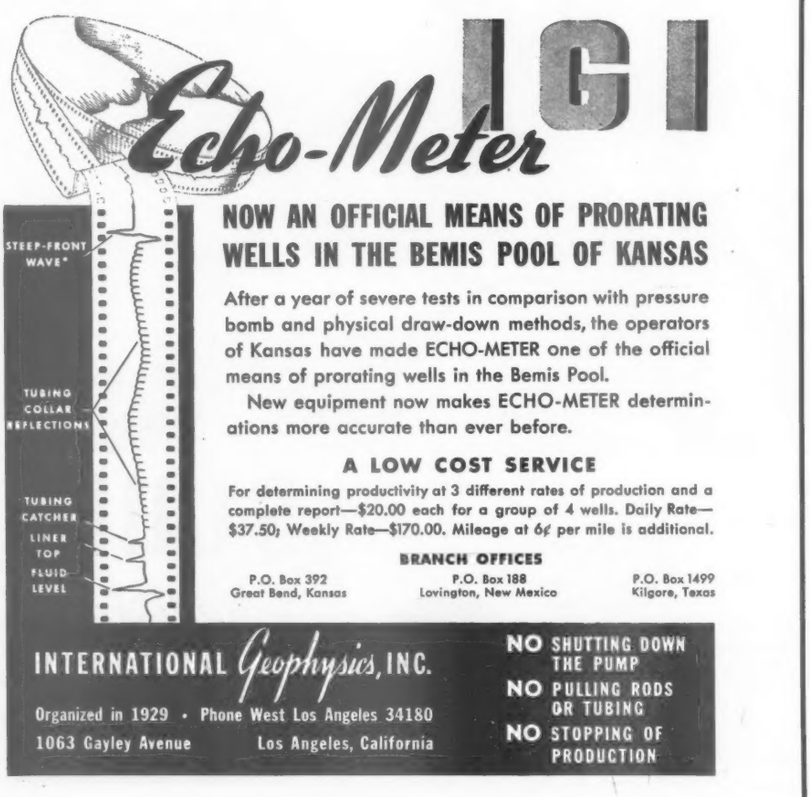
The Forest City basin has been a province known casually to Mid-Continent geologists for many years. In recent months the rather meager geologic details have been subjected to close scrutiny, however, due to an unusual lease campaign of first magnitude throughout the basin.

The present paper describes briefly the general stratigraphy, with particular reference to possible producing horizons; and also describes the interesting regional structure that characterizes the basin. The historical development of the structural grain is analyzed. Although the outline of the basin was definitely established by early Pennsylvanian time, the events in the geological history before and after that time, as they are revealed by the available data, are described.

Some features regarding sedimentation, the composition of ground waters, and an analysis of past drilling operations are summarized.

Harry Hanbury

This is intended to clarify a matter of identical names. The man pictured here is Harry Hanbury, a producer of Shreveport, Louisiana, residing in California and has no connection, whatsoever, in business or blood relation with the Harry Hanbury of New York City and Tulsa, who is a buyer of oil royalties.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PAPERS BY TITLE

8. CARL A. MOORE (Department of Geology, State University of Iowa, Iowa City, Iowa). Presented With Permission of the Director of the Oklahoma Geological Survey.

Preliminary Report on the Morrow Group of Northeastern Oklahoma.

Detailed field work during the summer of 1938, and subsequent insoluble-residue studies, have yielded considerable additional data on the character of the Morrow group of rocks in Adair County, Oklahoma. Sufficient information is at hand to permit the clear recognition of the divisions of the Morrow group into the Hale sandstone at the base and the Bloyd shale above. In addition, the Brentwood and Kessler limestone members of the Bloyd are well developed in Adair County. The Brentwood can generally be recognized throughout the county, and the westward extent of the Kessler has been determined to be about 5 miles west-southwest of Stilwell, Okla. Only by insoluble residue studies is it possible to differentiate between the limestone beds of the Hale formation, and the Brentwood and Kessler limestone members of the Bloyd formation. The Kessler member, in particular, has a diagnostic insoluble residue.

There is a marked disconformable contact between the Pitkin limestone and the Hale sandstone in almost every section measured and studied. In all but a very few cases this contact zone consists of a highly ferruginous, calcareous, conglomerate bed averaging less than 0.5 foot in thickness. It is invariably phosphatic.

The conclusion is reached that the Morrow group is lower Pottsville in age. In this area the Morrow should be defined to include the beds overlying the Pitkin formation of the Chester group; the disconformity between the two indicates a relatively short time break. The Morrow underlies the Atoka sandstone of upper Pottsville age (lower Des Moines age).

9. BRUCE H. HARLTON (Amerada Petroleum Corp., Tulsa, Okla.).

The Interpretation of Major Structural Features of the Northern Mid-Continent in Terms of Isostasy.

The principle of isostasy postulate the assumption that deposition and erosion control crustal deformation because columns under mountain masses and under areas of sedimentation are in equilibrium. Attention should be focused to the fact that these columns are of equal weight and are therefore compensated.

Here we are concerned with the decisive factors in establishing the mechanical causes from the effects of isostasy, which have been provided chiefly by sedimentation and erosion. The original folds are developed by lateral compression caused by the collapse of the earth crust on a shrinking interior. But all the major structures as we know them today have been developed by vertical thrust.

A systematic application of isostasy is given to the following major structures: the Wichita-Arbuckle mountains, the Nemaha ridge, the Seminole uplift, and the Central Kansas uplift. A brief reference also will be made to the Amarillo ridge, a western continuation of the Wichita Mountains, and the Red River arch, a cross fold related to the latter. All the structural features discussed inherited their trend lines from pre-Cambrian time.

10. F. B. PLUMMER and BRUCE GRANT (Bureau of Economic Geology, University of Texas, Austin, Tex.).

Oil-Shale Deposits of Central Texas.

The deposits of oil shale in the Barnett formation (late Mississippian), which outcrops along the north side of the Llano uplift in Central Texas are briefly described, and maps showing their occurrence and extent are presented. The origin and character of the shale are discussed and its petroliferous content described by a graph and a table of analyses. Although the shale is fairly uniform in thickness and in lithologic character, its oil content varies considerably from place to place. The thickest and most petroliferous spots appear to be located in synclinal areas. It is concluded that this shale is a source of some of the oil produced in the deeper wells in North Central Texas and that a detailed study of the distribution of the petroliferous material in it will furnish new information concerning the characteristics of source rocks.

F. B. Plummer

11. RAY L. SIX (Professor of Geology, Agricultural and Mechanical College, Stillwater, Okla.).

Reagan Sandstone Sedimentation.

The Reagan sandstone is the basal formation of the Paleozoic section as exposed in the Arbuckle and Wichita mountains of southern Oklahoma. The formation is of Upper Cambrian age.

In the Wichita Mountains the Reagan sandstone crops out in many places along the northeastern and southern flanks. In both flanks the formation has been distorted and contorted by the Wichita orogeny. In one place the Reagan rests upon a pre-Cambrian metamorphic. At the other exposure it rests upon pre-Cambrian igneous rock. In all places the relationship is unconformable.

In the Arbuckle Mountains the Reagan lies unconformably upon pre-Cambrian granites and other igneous rocks. West of the Washita River the formation occurs around the East and West Timbered hills. East of the Washita River five outcrops occur along the borders of the Tishomingo and other granites. The most extensive outcrops occur west of Troy and south of Mill Creek and north of Ravia.

The character of the environment in which the Reagan was deposited is discussed in some detail. The origin of the high glauconite and hematite content of some members is considered. Its relationship to other Cambrian sediments of the Central United States is developed. The conglomerate, basal, and otherwise, shale, sand, and calcareous phases are described in detail.

Thursday Afternoon, March 23

SILVER GLADE ROOM, SKIRVIN TOWER HOTEL

ECONOMICS SESSION

1:30 P.M.—4:30 P.M.

Presiding: Joseph E. Pogue, R. J. Riggs

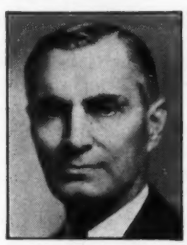
1. SIDNEY SWENSRUD (Assistant to the President, Standard Oil Co. of Ohio, Cleveland, Ohio).

1:30—The Relation Between Crude Oil and Product Prices. 20 Min.

Conclusion.—It seems probable that the downward price changes in the last year, first of products and then of crude, signify something more than the mere need for further regulation; they probably indicate that too much capital has flowed into the business recently, relative to the work to be done to meet the demand requirements. The immediate cause of the price reductions that have occurred probably are of less importance, therefore, than the fundamental one of repelling the flow of capital. So far as refining is concerned, there would seem to be nothing abnormal in the fact that the margin for refining declines from time to time when demand relative to supply diminishes. On the other hand, there appears to be an undue postponement in the response of crude oil prices to the same forces that cause downward movements in refined product prices. This situation has quite clearly operated to the disadvantage of the refining branch of the industry a large part of the time since the advent of proration.

2. DR. FREDERIC H. LAHEE (Sun Oil Co., Dallas, Tex.).

1:50—Wildcat Drilling in 1938.



Dr. Frederic H. Lahee

3. H. P. BYBEE (Geologist, University Lands, Box 2101, University Station, Austin, Tex.) and BERTE R. HAIGH (Geologist, University Lands, Box 1663, Midland, Tex.).

2:00—Developments in West Texas and Southeastern New Mexico During 1938. 15 Min.

The area covered in this paper extends westward from a line drawn north and south through San Angelo, Tom Green County, Texas, to include Eddy County, New Mexico, and southward from the north line of Cochran and Hockley counties in Texas to the Southern Pacific Railroad through Brewster and Terrell counties.

Berte R. Haigh

Drilling operations in the area during 1938 were 21.2 per cent less than in 1937. Additions to reserves consisted of four new discoveries, one rejuvenation, and extensions to several existing fields. Wildcat and outpost operations were 23.4 per cent greater in the area over 1937, but favorable results were rather limited. Southeastern New Mexico had 66 wildcats and outposts as against 43 in 1937, with two new discoveries and one rejuvenation. West Texas had 192 wildcat and outpost operations as compared with 166 during 1937, resulting in two new discoveries. Several fields in the area were extended, some of them vertically as well as laterally. A few of the outposts were definition wells, but the limits of some of the important fields are as yet unknown. Eighty-nine and six-tenths per cent of all operations were field wells.

Very little Ordovician testing was done during the year, and the results were negative.

4. GENTRY KIDD (Stanolind Oil & Gas Co., San Antonio, Tex.).

2:15—Developments in South Texas, 1938-1939. 10 Min.

Thirty-nine new fields were discovered in South Texas during the past year. In addition, 55 new sands in the older fields were proved for production. This record is exceeded only by the year 1937 and is above the records of prior years both in the number of discoveries and in probable additions of reserves.

The outstanding feature has been the development of important production from the lower Frio-Vicksburg along the updip side of the coastal province. This sand group has furnished some production in the past, but discoveries during 1938 place it among the major oil producing zones in the district. Of the discoveries, 8 fields and 27 sands were from this zone. Probably the more important of the fields are Alice in Jim Wells County, Kelsey in Jim Hogg County, and Sun in Starr County.

The downdip side of the coastal province again furnished substantial additions to reserves with nine new fields, numerous extensions and additional sands. Among these fields are Cordele, West, and Francitas in Jackson County, La Rosa and Melon Creek in Refugio County, and Riverside in Nueces County.

The Jackson trend continued to lead in the number of discoveries with 16 new fields. Excepting Fitzsimmons in Duval County, most of these may be relatively small.

Likewise the six Cretaceous fields opened in the fault line may have small discoveries.

5. J. J. MAUCINI (Geologist, Continental Oil Co., Wichita Falls, Tex.).

2:25—Development in North Central Texas, 1938. 10 Min.

New developments and discoveries in North Central Texas during 1938 have materially increased the importance of the Strawn sands as major producing zones in the Wichita Falls area and have increased the scope of Canyon and Cisco "pays" in the Abilene district.

The most important new discovery in the Strawn in the Wichita Falls district was the Hull-Silk pool in northern Archer County. A smaller but highly significant discovery was the Adams Oil Co.'s Moer No. 1 well near the town of Scotland, which was completed in the Finley "pay" (one of the Hull-Silk pool zones) producing approximately 115 bbls. per day pumping.

Important extensions were made east and west of the K.M.A. field.

The Sinclair Prairie Oil Co. opened a new pool in the Delaware Bend area of Cooke County with its Best No. 1 and Rogers & Rogers projected Montague County into the limelight by the completion of Burnett No. 1 near the town of Nocona. Both are in lower Strawn "pays."

Madden & Goldsmith and King Oil opened a new Canyon pool (Chalk Hill "pay") in the Holliday district, Archer and Wichita counties.

A small Bend pool was opened by Continental and Petroleum Producers on state asylum lands on the outskirts of Wichita Falls.

Important extensions to the James and Sims pools in southeastern Young County and discoveries by the Anzac Oil Co. and R. V. Tidwell in southwestern Young, and the Wray pool in central Young kept interest active in the Bend areas of Young, Jack, and Throckmorton counties.

In the Abilene district, the Chittenden pool northwest of Anson, the Ness pool southeast of Anson, and the Steffins and Hedrick pools were opened in Jones County, and important extensions were made to the Noodle Creek and the Avoca pools. In Shackelford County a new pool was opened on the Diller ranch, and in Coleman County the Novice pool was brought in about 1 mile west of the town of Novice.

6. O. L. BRACE (Consulting Geologist, 804 Second National Building, Houston, Tex.).

2:35—Review of Developments in 1938, Gulf Coast of Southeast Texas and Louisiana. 20 Min.

A progressive change in the outstanding structural type, from major piercement domes with very shallow salt cores, to deeper piercement domes, to deep-seated major closure domes, and finally to the important minor closure features of today, has characterized the history of field discovery of the Gulf Coast since Spindletop. Because of depositional influences that are fundamental to the local occurrence of oil, commercial deposits on the coast are related to geologic and geographic zones, the boundaries to which are arbitrarily recognized.

This change in discovery type partially explains the fact that despite a very active year throughout the coastal district of Texas and Louisiana during 1938, newly discovered reserves that have resulted from recent exploration do not compare favorably with the totals of previous years. The 20 new producing areas of Louisiana are characterized in a majority of cases by production from sands at great depths, where gas-oil ratios are sufficiently high to be a troublesome factor. Of the nine Texas discoveries, three indicate that they may justify a major rating, while the remainder are of unproved potentiality or are of very questionable merit.

Additional discoveries in the Sparta-Wilcox sand zone along the Conroe trend, both in Texas and Louisiana, have assured this area an intensive period of activity for the immediate future. It is generally conceded that this is the most important new coastal sand development since the discovery of production in the Frio.

Extensions to proved fields and development in deeper sands have added greatly to the reserves in established areas of production during 1938.

7. W. C. SPOONER (Consulting Geologist, Atlas Building, Shreveport, La.).

2:55—Developments in North Louisiana-South Arkansas, 1938. 10 Min.

8. E. F. SHEA (Stanolind Oil & Gas Co., Tulsa, Okla.).

3:05—Developments in Oklahoma During 1938. 10 Min.

The year 1938 marked another 12-month period during which the volume of newly discovered petroleum reserves in Oklahoma failed by a substantial margin to offset withdrawals.

Total production of oil in the state during 1938 was approximately 170,000,000 bbls., a decrease of 23 per cent from the total for the preceding year. There were approximately 2,000 wells completed during the year, representing also a decrease of 30 to 35 per cent from the total well completions for 1937. The seismograph continued to be the chief exploratory method employed in the search for new structures, but there was a 20 per cent reduction in the average number of crews as compared to the preceding year. The majority of these crews were engaged in closer detail work in areas already rather intensively explored.

There was very little decrease in wildcat drilling operations. Of the 2,000 well completions, 220 (or 11 per cent) might be classified as exploratory wells. By far the greater number of these were located adjacent to producing pools in the central part of the state. As a result of the drilling of these 220 wildcat wells, 42 new producing areas were discovered. Of this total, 16 might be considered as extensions to known pools and 26 as new pools. Thirty-nine of the discovery wells produced oil and three produced gas. Pennsylvanian sediments accounted for the production in 19 of the discoveries, Siluro-Devonian in 4 wells, and Ordovician in 19 wells.

It is unfortunate that by far the greater majority of the discoveries reveal as yet only relatively unimportant reserves. The outstanding discoveries as indicated by development to date were the Ramsey pool, in Payne County, and the Alma Oil Co. extension to the St. Louis pool, in Pottawatomie County. Developments subsequent to discovery around outlying wildcats at Noble, in Cleveland County, and at Hillsdale and Waukomis, in Garfield County, have been quite disappointing. Drilling activities in the older pools of the state were largely routine, with the Seminole-St. Louis areas furnishing the greatest number of completions. The Oklahoma City pool continued to lead the state in output, with an annual production during 1938 of 38,796,000 bbls. The Fitts pool with 16,655,000 bbls. ranked second.

9. RYCROFT G. MOSS (Phillips Petroleum Co., Wichita, Kans.).

3:15—Developments in Kansas in 1938. 10 Min.

Drilling activity in Kansas dropped about 41 per cent from the previous year. The dry-hole percentage rose about 1 per cent and the average initial potential of oil wells fell nearly 100 bbls. The use of acid in the Southwest Kansas gas area increased the initial potentials in this area about 25 per cent.

The general oil-producing area of western Kansas was extended about 15 miles northwest by the discovery of the Morel pool in Section 15-9s-21w, Graham County. Activity continued in the Zenith pool where 90 wells were drilled during the year. Discovery of Arbuckle dolomite production in the old Hittle pool was an important development in Cowley County for the year.

Early in the year there was considerable leasing activity in Graham, Sheridan, and Decatur counties which was caused by the discovery of the Morel pool. A very active leasing campaign was in progress at the close of the year in the Forest City basin in northeastern Kansas and adjoining areas.

10. ALFRED H. BELL (Illinois State Geological Survey, Urbana, Ill.) and GEORGE V. COHEE (Illinois State Geological Survey, Urbana, Ill.). Published With the Permission of the Chief of the Illinois State Geological Survey, Urbana, Ill.

3:25—Recent Developments in Illinois, With Special Reference to Formations Below the McCloskey. 10 Min.

Alfred H. Bell

George V. Cohee

The recent discovery of Devonian oil produc-

(Continued on Page 64)

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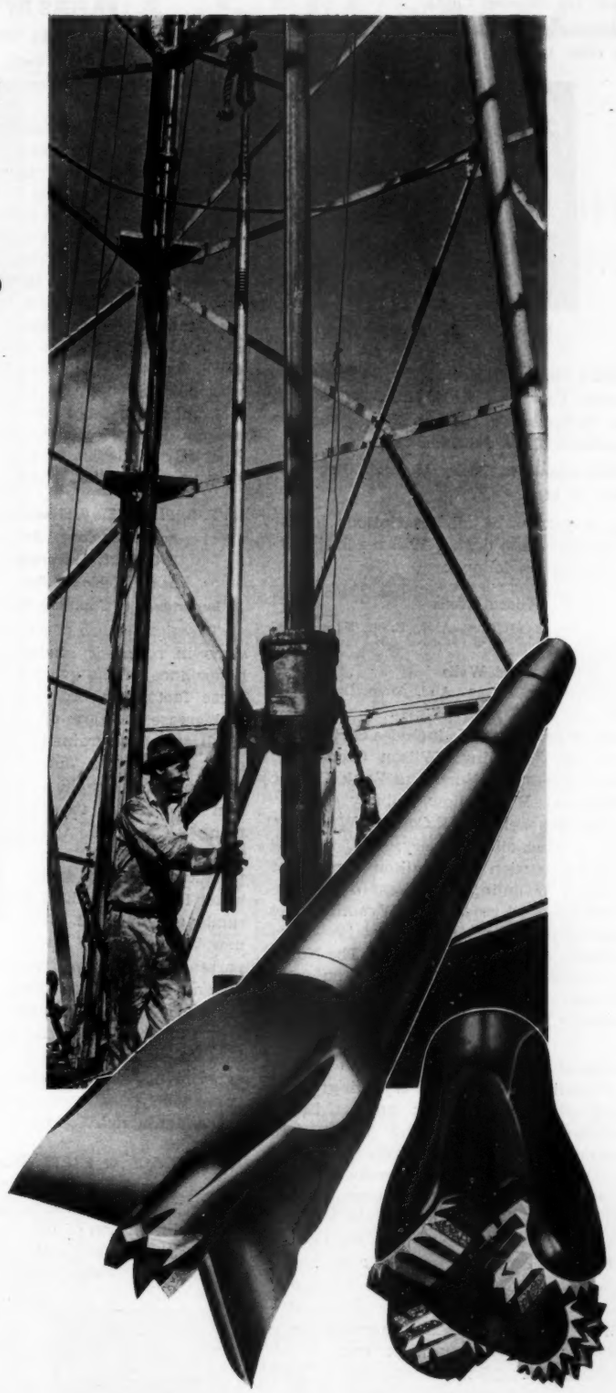

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tion in the old Sandoval field has focused attention on Devonian possibilities in the Illinois basin. As yet there has been relatively little testing of pre-Ste. Genevieve formations in the region. This paper reviews the known occurrences in Illinois of oil in the Mississippian below the Ste. Genevieve and in the Devonian, Silurian, and Ordovician systems.

A brief statement regarding developments in Illinois during 1938 and up to the early part of March, 1939, is included.

11. HAROLD W. HOOTS (Chief Geologist, Richfield Oil Corp., Los Angeles, Calif.).

3:35—Additions to Oil Reserves in California During 1938. 10 Min.

Harold W. Hoots

12. J. M. KIRBY (District Geologist, The California Co., Denver, Colo.) and H. N. HICKEY (Geologist, The California Co., Denver, Colo.). Read by Permission of the California Co.

3:45—Developments in Rocky Mountain Region in 1938. 10 Min.

Drilling operations of all descriptions in the Rocky Mountain region during 1938 reached a total of 483, divided as follows:

Wildcat Wells

1938—	Oil	Gas	Abd.	Susp.	Drlg. 1-1-39
Completions	5	3	43	61	48

Field Wells

1938—	Oil	Gas	Abd.	Susp.	Drlg. 1-1-39
Completions	156	34	52	33	48

Discovery of new oil fields includes Cole Creek, Natrona County, Wyoming; Wilson Creek, Rio Blanco County, Colorado; North Cut Bank, Glacier County, Montana; Big Hollow, Albany County, Wyoming; and Shoshone, Park County, Wyoming. The last is a black-oil discovery, and, coupled with the field extension at Hamilton dome, Hot Springs County, Wyoming, promises to add materially to the black-oil reserves of Wyoming. The shallow discovery at Big Hollow is of low gravity, and probably of minor significance. The North Cut Bank discovery is the first Moulton sand (Kootenai-Lower Cretaceous) oil producer, although several wells have been completed in this zone.

Extensions of other proved fields were accomplished at Frannie, Park County, Wyoming; West Kevin, Toole County, Montana; and at Lance Creek, Niobrara County, Wyoming. The 18 Leo sand (Minnelusa) completions at Lance Creek during 1938 indicate that the ultimate productive area from this zone may exceed 5,500 acres, with a gross recovery approaching 50,000,000 bbls.

Deepening or recompleting wells in the proved fields resulted in a Tensleep discovery at Mahoney dome, Carbon County, Wyoming, and in a small oil well from shallow Wasatch sands at Hiawatha, Moffat County, Colorado. Mahoney dome had previously produced natural gas commercially from the Dakota and Sundance sands, and Hiawatha, gas from shallow Wasatch sands.

New gas fields resulted during 1938 from drilling at Beaver Creek, Fremont County, Wyoming; at Oil Springs, Carbon County, Wyoming; and in Section 30-37n-4w, Glacier County, Montana. The last discovery is 4 miles north of the main Cut Bank gas area, and produces from the Moulton sand. The gas at Beaver Creek was found in a sand of the Morrison formation; and, at Oil Springs, in the Lakota and first and second Sundance sands. Extension of the Muskrat gas field, Fremont County, Wyoming, and of the Clay Basin gas field, Daggett County, Utah, was accomplished also by 1938 drilling.

The gross production of oil in the Rocky Mountain region (exclusive of southeastern New Mexico) for 1938 is estimated at 25,556,000 bbls., as compared with 27,187,000 bbls. in 1937.

13. BASIL B. ZAVOICO (The Chase National Bank, Houston, Tex.).

3:55—Foreign Developments During 1938. 15 Min.

PAPERS BY TITLE

14. FREDERICK G. CLAPP (Consulting Geologist, 50 Church St., New York).

4:10—Geological Exploration in Eastern Iran. 20 Min.

In 1937 and 1938 extended reconnaissances were made by American geologists, working in a large area in eastern Iran under the direction of the writer. The country is a plateau with average altitudes of 3,000 to 6,000 feet; various ranges are 10,000 to 12,000 feet high and some peaks are 15,000 to 18,000 feet. Throughout the plateau a number of basins, due largely to faulting, are as low as 1,000 to 3,000 feet in altitude. The formations range from Cambrian to Recent. The composite columnar section may amount to 15,000 to 20,000 feet, and both the Cretaceous and Eocene sections are locally as much as 10,000 to 13,000 feet, but not in the same localities. Much faulting and considerable overthrusting have taken place, especially in the Elburz Mountains. Several prominent unconformities exist.

15. F. B. PLUMMER (University of Texas, Bureau of Economic Geology, Austin, Tex.) and H. K. LIVINGSTON (University of Texas, Bureau of Economic Geology, Austin, Tex.).

Importance of Capillary Phenomena in Oil Production.

The significance of surface and interfacial tensions in reservoir studies is discussed, and the importance of discovering methods to deal with these factors in order to increase the flow of oil through fine-grained rocks is pointed out. The possible application of chemical treatment to reduce the flow of water into wells producing both oil and water from fine-grained sands are outlined. A new experimental apparatus for studying radial flow of mixtures of oil and water is described, and tentative results of laboratory experiments with detergent chemicals introduced into the oil sands to reduce the flow of water are given. It is thought that the experiments have special significance in reservoirs where salt-water injection is being tried or contemplated.

H. K. Livingston

16. WALLACE E. PRATT (Director, Standard Oil Co., New Jersey, 30 Rockefeller Plaza, New York).

The Basis of Proration in Texas. 20 Min.

The institution of proration is vital to the welfare of the oil-producing industry in the United States; yet its essential function is so widely and so commonly misinterpreted that its utility and even its continued existence are gravely menaced. Petroleum geologists are particularly concerned with the success of true proration and should not fail to understand its fundamental character. The popular belief among oil producers makes of proration a form of curtailment designed to prevent overproduction of crude oil and thereby to secure and maintain higher prices and an assured market outlet for every producer. In contrast to this generally held concept, proration in Texas, where (despite the fact that it had its inception in Oklahoma) it has evolved farthest and has been applied most widely and drastically, rests solely on (1) the conservation laws for the prevention of physical waste of oil and gas, and (2) the police powers of the state for the protection of the citizen in his basic property rights. Any curtailment of production by agreement (except curtailment of agricultural production) is specifically prohibited by the antitrust laws of the state.

Valid proration in Texas, then, merely prevents physical waste. It does not supersede nor set aside the "law of capture." On the contrary, it functions fully within the operation of the law of capture. Nevertheless, it ameliorates effectively the excesses and inequities that have arisen out of the application of the law of capture in the past. Even the provision for "limitation to market demand," frequently denounced by economists as an unsound and meretricious "production control," is in fact fully justified (and justified only) as a means of preventing physical waste. Likewise, the prevention of physical waste as a function of oil-production engineering takes on a significance not generally recognized. In the absence of proration the prevention of physical waste becomes impossible.

If the industry persists in its attitude that proration is a device to be used by the individual states or by the Interstate Compact to curtail the production of oil for the purpose of "stabilizing the industry" or "improving the price level," it will jeopardize the life of a concept which in preventing physical waste can render great service to oil producers.

17. G. W. PIRTLE (Hudnall & Pirtle, Tyler, Tex.).

Developments in East Texas During 1938.

Friday Morning, March 24

SILVER GLADE ROOM, SKIRVIN TOWER HOTEL

MISSISSIPPI EMBAYMENT SESSION

9:45 A.M.—12:35 P.M.

Presiding: D. Perry Olcott, John M. Vetter

1. JOHN D. TODD (Consulting Geologist, Sterling Building, Houston, Tex.) and FRANK C. ROPER (Consulting Geologist, Sterling Building, Houston, Tex.).

9:45—The Sparta-Wilcox Trend. 30 Min., Including Discussion.

This recently discovered productive trend of the Upper Gulf Coast of Texas and Louisiana is considered to be limited by the —5,000-foot contour on the north and the —9,000-foot contour on the south.

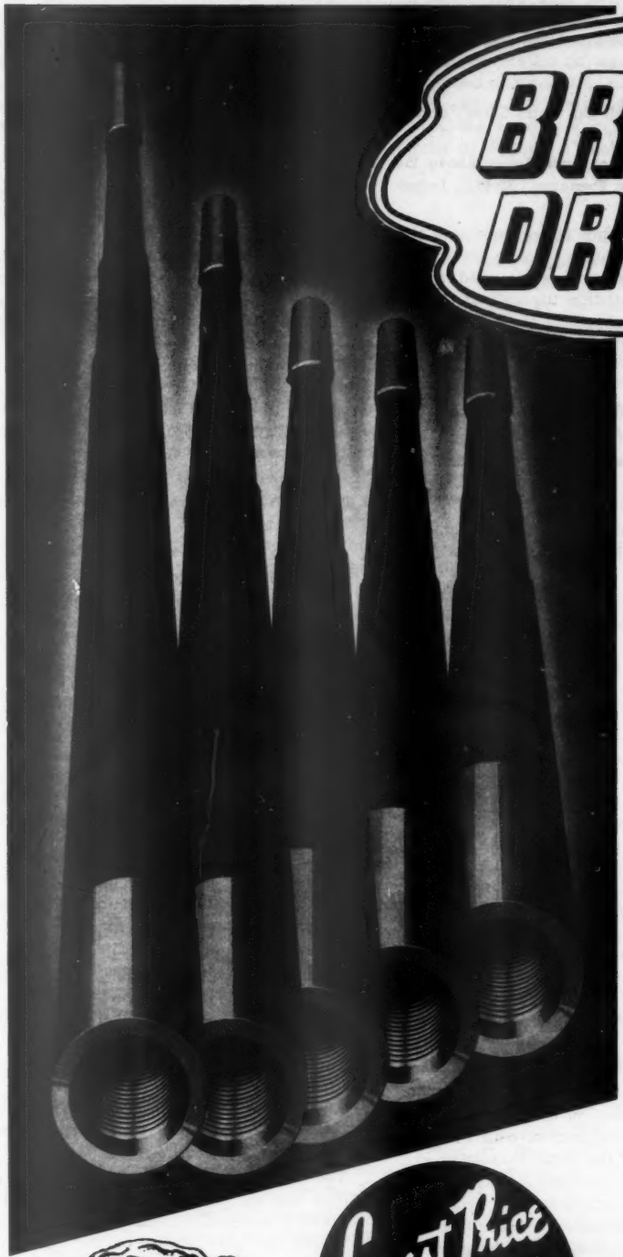
The sand conditions are such that this trend is comparable in productive possibilities to the other major producing trends of the Gulf Coast.

2. J. C. POOLE (Barnsdall Oil Co., Corpus Christi, Tex.).

10:15—The Saxet Field, Nueces County, Texas. 25 Min., Including Discussion.

The Saxet field was discovered in 1923 and was known only as a gas field until the latter part of 1930 when the first oil well was completed. Oil development was slow until 1935 because of class of wells obtained. Core records of early wells indicated that the oil and gas sands tested salty which resulted in the passing up of commercial sands.

In September, 1935, an excellent high-gravity oil well was completed which led to a very rapid



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development of the field which to date numbers 15 more or less regularly developed oil sands and some 13 erratic ones, with a proven area of some 8,300 acres. The age of production ranges from the Oakville through the Frio.

From a geological standpoint, the most interesting feature of the field is the intricate faulting problem presented. First, the field is divided by a large curved fault trending northeast-southwest which effectively separates the area into two separate pools.

Oil accumulation on both sides is further complicated by a series of minor faults. The major fault is downthrown toward the coast. The minor faults on the upthrown side of the major fault form horsts and grabens while the minor faults on the downthrown side of the major fault are apparently all of a compensating nature and are downthrown toward the major fault.

The Corpus Christi field on the east, the Turkey Creek field on the west, and the Baldwin field on the south, may all very easily be connected with, and be a part of, the Saxet field.

At present there are about 600 producing wells with a daily allowable of approximately 40,000 bbls. Accumulative production to date is approximately 30,000,000 bbls.

3. F. W. ROLSHAUSEN (Humble Oil & Refining Co., Houston, Tex.).

10:40—Fossil Horizons of the Gulf Coast. 30 Min., Including Discussion.

As a result of sample examinations over a period of 20 years, it has been found that key fossils are confined to certain areas. These areas have the same general strike as the present Gulf Coast. Although the areas overlap to some extent, numerous key fossils have well defined limits.

4. ED J. HAMNER (Humble Oil & Refining Co., Genoa, Tex.).

11:10—Amelia Oil Field, Jefferson County, Texas. 25 Min., Including Discussion.

The Amelia oil field, located 5 miles west of Beaumont, Jefferson County, Texas, was discovered in 1936. Geophysical evidence of this structure was responsible for the discovery but was rather indefinite as to the true structural conditions. No surface geological indications of structure are present. The subsurface conditions are those of an elliptical, flat dome, probably underlain by a deeply buried salt mass, and further complicated by a large normal fault striking parallel with the long axis of the dome. This fault has the unusual distinction of having production from its downthrown side while the upthrown side is dry.

The producing sand, locally known as the "Langham sand," belongs to the Oligocene-Frio formation, and is found from 6,694 feet to 6,785 feet although only the last 20 feet is productive of oil. The sand is a thick, blanket sand body literally surrounded by salt water sands and has an extensive gas cap above the oil zone.

The field has a proved area of 1,220 acres and has produced 2,644,642 bbls. of oil, January 1, 1939, which gives an average of 2,168 bbls. per acre. The present daily allowable under strict proration is 4,374 bbls. from 114 producing wells. The Humble Oil & Refining Co. operates 111 wells, or 98 per cent of the entire field; the only other operator being the Normandie Oil Corp. with three wells. Drilling development, regarding present known conditions, is entirely finished.

The development of this field was interesting, not only from the disclosure of its peculiar geological features, but also from the standpoint of unusually difficult well completion problems. A new method of completing high ratio wells by squeeze cementing was introduced at Amelia and has since been used extensively in other fields throughout the Gulf Coast region.

5. JOHN M. CLAYTON (Gulf Oil Corp., Corpus Christi, Tex.).

11:35—Producing Sands of South Texas Above the Top of the Jackson Formation. 30 Min., Including Discussion.

Principal producing sands above the top of the Jackson formation in South Texas are stratigraphically divided into groups or sand series which are generally consistent throughout the entire coastal trend. The object of this paper is to discuss these groups and their comparative importance.

6. M. FRANK REEDY, JR. (Department of Geology, University of Texas, Austin, Tex.).

12:05—Subsurface Eocene Zones of the Gulf Coast. 30 Min., Including Discussion.

The construction of two dip sections in Texas, one dip section in Louisiana, and a cross-section extending through the East Texas and the Louisiana embayments to the Mississippi River, have disclosed the regional trends of the Eocene in its down-dip to marine facies. The use of electrical logs upon which the paleontological points have been superimposed for these sections, has made it possible to recognize the change in the facies and the foraminiferal zones suitable for correlation. The trends of potential production in the Cockfield, Sparta, and Wilcox sands form the concluding statements of this paper.

PAPERS BY TITLE

7. C. W. SANDERS, JR. (Shell Petroleum Corp., Houston, Tex.).

The Emba Salt-Dome Region, U.S.S.R., and Some Comparisons With Other Salt-Dome Regions.

Although oil has been produced since 1908 from salt domes in the Emba area, which lies between the south end of the Ural Mountains and the north shore of the Caspian Sea, the geological situation in that region has escaped the attention of many American geologists. Salt-dome geologists of the Gulf Coast region have frequently had their attention directed to the salt structures of Germany and Rumania, whereas greater resemblance to the Gulf Coast in many respects is to be found in the Emba district, where more than 100 salt domes are known, and many more suspected, in an area about the size of the Gulf Coast exclusive of South Texas. Only six domes are being exploited but many others have shown evidence of accumulations of oil and gas. Production has been found in "Permo-Triassic," Jurassic, and Cretaceous strata, but chiefly in Jurassic sands. The oil reserves appear to be commercially important but do not rank with those of the Gulf Coast. Total oil production to date is estimated at about 41 million barrels.

The Emba mother salt series is almost certainly of Permian age—probably upper Permian. The overburden is much thinner than that of the Gulf Coast, consisting chiefly of Mesozoic strata, with local patches of Tertiary sediments. The coastal area is blanketed with a mantle of Quaternary (Caspian) beds. Many of the shallow structures are larger than any Gulf Coast shallow domes. Future exploration will probably reveal an increasingly larger percentage of deep domes.

More is known about pre-salt strata in the Emba region than in the Gulf Coast because of the outcrops in the southern Urals, where the Upper Carboniferous and Permian sections have been rather closely correlated with the Pennsylvanian and Permian sections of the Mid-Continent region, largely on the basis of the ammonites contained.

Development has been slow in the Emba district due largely to the remoteness of the area, the long winters, and the thinness of the sands as compared with the prolific Tertiary sands of the Caucasus belt.

The tectonic setting of the Emba domes is discussed and compared with that of the salt domes of the Gulf Coast, of the North German basin, of Persia, and of the Carpathian foothills belt in Rumania.

8. R. C. BOWLES (Standard Oil Co. of Kansas, Houston, Tex.).

Benavides Field, Duval County, Texas.

The Benavides field is located 3 miles south of the town of Benavides in central Duval County. It was proved for production on April 27, 1937. On that date, Frank Gravis completed his No. 1 Vaello-Puig at a total depth of 4,768 feet, flowing 45° Be. gravity oil at the rate of 90 bbls. per day through tubing choked to one-eighth of an inch in diameter.

The discovery sand is in the Jackson group, Eocene system, Tertiary era. Five additional sands of Jackson age have been proved for commercial oil production. Also one sand of the early Oligocene system of the Tertiary era is producing oil.

Structural irregularity is expressed by folding and faulting. Gas and oil accumulation in certain sand horizons is due to closure within the individual sands as they grade into shale across the fold and in the normal updip direction. In the other producing sands the gas and oil accumulation is due to structural closure.

As of January 1, 1939, the Benavides field had produced 4,394,896 bbls. of oil from a total of 236 wells.

9. R. J. METCALF (Ohio Oil Co., Houston, Tex.).

Deposition of the Lissie and Beaumont Formations of the Gulf Coast of Texas.

The Lissie formation was deposited on a peneplained surface. Later action of major streams produced a series of alluvial plains near the coast on which the later phases of the Lissie and the Beaumond were deposited under a flood plain environment. The Beaumont was a continuation of the same cycle of deposition by a series of distributaries on a plain of very low relief.

10. C. LATHROP HEROLD (Shell Petroleum Corp., Houston, Tex.).

Geology of Sulphur Bluff Oil Field, Hopkins County, Texas.

The Sulphur Bluff oil field, discovered in August, 1936, is in northeastern Hopkins County on the Mexia-Talco fault system of Northeast Texas. Oil is produced from the upper sands of the Paluxy formation (Lower Cretaceous), which occurs at the average depth of 4,450 feet. Structural closure against a normal fault forms the trap in which the oil accumulated. The productive area, 3 miles long and half a mile wide, is on the upthrown side of the east-west

fault, which has a displacement ranging from 350 to 400 feet in the Eocene (surface outcrop) to 750 feet (estimated) in the Lower Cretaceous. First evidence of favorable structural conditions was disclosed by surface mapping, supplemented by core drilling and later confirmed by subsurface data obtained from several dry holes drilled to the Woodbine formation (Upper Cretaceous).

A total of 74 producing wells have been drilled, resulting in an average density of one well to 12 acres within the productive limits which are virtually defined. A deep test, which penetrated 434 feet into the Travis Peak formation (Lower Cretaceous), was drilled in 1938, but it failed to encounter commercial oil production below the Paluxy. The total production to January 1, 1939, is 3,318,955 bbls.

11. E. M. RICE (Pure Oil Co., Tyler, Tex.) and F. J. SCHEMPF (Stanolind Oil & Gas Co., Tyler, Tex.).

Subsurface Correlations of the Lower Cretaceous (Comanche) of Central East Texas

The use of Schlumberger records, sample and core descriptions has greatly facilitated and increased the accuracy of subsurface correlations in many areas. Advantage of these has been taken to further the study of the Comanche beds encountered in the subsurface of Central and East Texas.

The eastward truncation of the Comanche, as pointed out by Miser and others, is diagramatically set out. The beds that are present are, in most places, identifiable. The lensing-out of beds is depicted as are other features such as the different facies of the Paluxy and the upper and lower Glen Rose. Structural and regional thinning are shown by cross sections.

Friday Afternoon, March 24

SILVER GLADE ROOM, SKIRVIN TOWER HOTEL

EASTERN INTERIOR BASIN SESSION

1:30 P.M.—4:30 P.M.

Presiding: A. H. Bell, Vernor Jones

1. J. MARVIN WELLER (State Geological Survey, Urbana, Ill.) and A. H. SUTTON (Geology Department, University of Illinois, Urbana, Ill.). Published by Permission of the Chief of the Illinois State Geological Survey, the Director of the Kentucky Geological Survey, the State Geologist of Indiana, and the Director of the Missouri Bureau of Geology and Mines.

1:30—Mississippian Border of Eastern Interior Basin. 30 Min., With Discussion.

The Mississippian system along the borders of the Eastern Interior basin has been studied in considerable detail during the last 30 years but

J. Marvin Weller

A. H. Sutton

the results of most of this work have not yet been published. This paper briefly discusses the stratigraphy, paleontology, sedimentation, structure, and lists petroleum-bearing beds of the Mississippian system in Illinois, Indiana, western Kentucky, eastern Missouri, and southeastern Iowa as based upon the published and unpublished investigations of more than 25 geologists and their numerous assistants, who worked mainly under the auspices of the various state geological surveys. Slight innovations in the classification and the interpretation of the Mississippian system are proposed and possible errors in nomenclature and correlation are pointed out. Accompanying maps show the areal geology from Mercer County, Illinois, to Putnam County, Indiana, and included more than 50 15-minute quadrangles which have been studied in detail.

2. L. E. WORKMAN (Illinois State Geological Survey, Urbana, Ill.) and J. NORMAN PAYNE (Illinois State Geological Survey, Urbana, Ill.). Published by Permission of the Chief of the Illinois State Geological Survey.

2:00—Subsurface Geology of the Mississippian System in Illinois. 60 Min., With Discussion.

(1) The Chester Series, by Workman.

The Chester series underlies most of the southern half of Illinois east of East St. Louis. Except where they have been removed by post-Chester erosion, all of the formations in the standard

L. E. Workman

J. Norman Payne

Chester section can be identified in the area. Producing horizons are the Cypress and Bethel sandstones, both of which are in the lower part of the Chester series. The maximum known thickness is 1,450 feet at a point in the most southerly portion of the area. Because of northward thinning of individual formations, the original thickness of the entire section in the northern part of the area was probably half of this. Uplift, warping and peneplanation previous to the deposition of Pennsylvanian sediments caused truncation of the series throughout the basin and scalping of local structures. The isopach map indicates two major pre-Pennsylvanian anticlinal areas in which are located a large proportion of the Illinois oil fields, one the LaSalle anticline, and the other an uplift running southeast from the region of Sorento.

(2) The Iowa Series, by Payne.

The Iowa, or lower Mississippian, series consists of the formations belonging to the Kinderhook, Osage, and Meramec groups. The Kinderhook group is made up almost entirely of shales with one or two thin limestones near the top. The Osage group is composed dominantly of silty shale and siltstone throughout the Illinois basin except in the extreme western and northwestern parts where the group can be separated into the typical Fern Glen, Burlington, Keokuk, and Warsaw formations. The Meramec group, consisting of the Salem, St. Louis, and Ste. Genevieve formations, is composed almost entirely of limestone and dolomite which lend themselves readily to separation by means of insoluble residues. The Iowa series reaches a maximum thickness of 2,000 feet in Gallatin County. This is probably due to thickening of the individual formations. Local variations in the thickness of the series and beveling of upper Iowa strata in Bond and Clark counties indiate some pre-Chester folding.

3. LYNN K. LEE (The Pure Oil Co., Olney, Ill.).

3:00—The Geology of the Basin Fields in Southeastern Illinois—A Preliminary Report. 35 Min., With Discussion.

The basin fields of southeastern Illinois are so named because of being located near the center of the Illinois basin. Production has so far been obtained in Wayne, Clay, and Richland counties in a series of fields extending for 45 miles north and south. It is highly improbable that the producing areas will connect.

Production was discovered in March, and active development was commenced in May, 1937. To January, 1939, the production from 475 wells was 12,416,000 bbls. Daily average production at that time was 66 bbls. per well. Large initial productions are common, and decline is rapid for the first few months. Twenty-acre spacing is prevalent.

All except the Flora field are associated with a general north-south anticline, which has a slight southward plunge of the axis into the deeper part of the basin. Accumulation has for the most part been on local closures along the axis, but some production has been obtained from noses and terraces on the flanks on the main feature.

Little is known of the pre-Mississippian structural history. The known period of major deformation was post-Mississippian pre-Pennsylvanian; however, subsequent to this there was recurrent folding.

Production is from oolitic limestone of the Ste. Genevieve formation (McClosky) except in the North Noble field, where it is from the Cypress (Weiler) standstone, the former being in the upper part of the lower Mississippian and the lower part of the middle Chester.

The Cypress is a widespread sandstone but locally subject to lensing into beds of sands and shales and even completely to shale. It is believed that Chester sandstone production will become more important as development extends northward. The oolitic character of the Ste. Genevieve is persistent over the area; however, porosity occurs in lenses of variable proportions laterally and vertically. Approximately 10 per cent of the holes drilled within the limits of production are dry because of lack of porosity in the lime; however, porosity is more persistent on the structures than in the synclines. The relation of the contact of the Ste. Genevieve to the overlying Chester is controversial; however, the data do not indicate an angular unconformity of any extent at this contact in the deeper part of the basin.

Small production has been obtained from pre-Mississippian beds on the east and west flanks of the basin; however, since no test below the Mississippian has so far been drilled on structure in the area under consideration, the deeper possibilities for production are highly speculative.

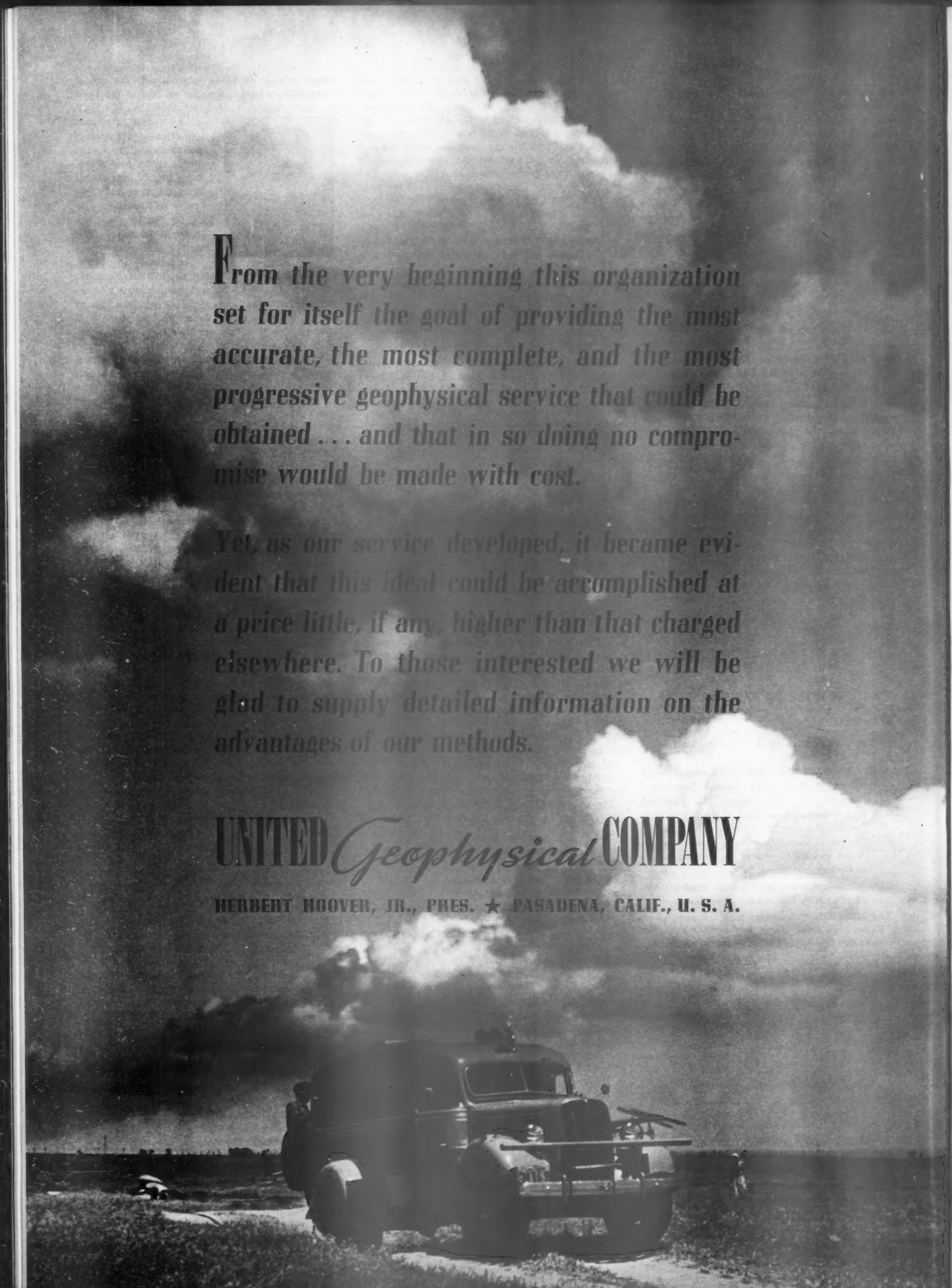
4. H. H. ARNOLD, JR., (Texas Co., Tulsa, Okla.).

3:35—The Salem Oil Field Area, Marion County, Illinois. 35 Min., Including Discussion.

The Salem oil field, Marion County, Illinois, was discovered by the Texas Co. on July 1, 1938. During the week of January 7, 1939, the field ranked seventh in the United States on the basis of daily production. Six months after the discovery date the field has produced a total of 2,894,964 bbls.

All producing formations of the Salem field are Mississippian in age and include the Benoist sand, the Aux Vases sand, and the McClosky zone. At present the Benoist sand is the principal zone being developed; however, drilling to the McClosky zone is increasing in intensity.

A geologic study of the Illinois basin indicates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early periods of structural adjustment. Marked zones of incluence are thought to have been established by these movements. In certain areas of the basin late Mississippian and early Pennsylvanian structural developments have a close relationship to these early established zones.

Subsurface mapping of the Salem field on the Benoist sand and the McClosky zone indicate close similarity in structural definition. No increase of structural relief with depth is apparent on the data supplied by present drilling.

5. L. M. CLINE (Iowa Geological Survey, Ames, Iowa). Published by Permission of the Director of the Iowa Geological Survey.

4:10—A Comparison of the Pennsylvania Des Moines Series of Southern Iowa and Northern Missouri. 15 Min., Including Discussion.

A series of carefully measured outcrop sections made in a strike traverse from Guthrie County, Iowa, to counties in Missouri south of the Missouri River show that most of the limestone and coal units of the Des Moines series persist through their area of outcrop in Iowa and that there is very little lateral variation in lithology. Certain of the limestones, for example the Ardmore, are so distinctive that they are useful key beds in mapping although some of them are very thin. Most of the units that the Iowa Geological Survey recognizes can be correlated with the units that the Missouri Survey recognizes in northern Missouri.

Thursday Morning, March 23

PALEONTOLOGY AND MINERALOGY DIVISION

Society of Economic Paleontologists and Mineralogists

CRYSTAL ROOM, SKIRVIN HOTEL

Technical Session

10 A.M—12 M.

Presiding: E. H. Sellards

1. A. K. MILLER (Associate Professor of Geology) and W. M. FURNISH (Research Associate in Geology, State University of Iowa, Iowa City, Iowa).

10:00-10:20—Permian Ammonoid Zones.

Ammonoids are one of the best groups of fossils for the correlation of late Paleozoic strata. Because they were free-swimming mobile creatures, they were able to migrate long distances, and closely similar forms are found all over the world. We have been able to study specimens from essentially all of the important Permian localities, and our conclusions are therefore based on direct observations as well as on the literature. Sequences of Permian ammonoid zones were first established independently and almost contemporaneously by Bose in West Texas and by Haniel in Timor. Their work has since been amplified, refined, and perfected by other authors as new discoveries were made. We are attempting to bring the entire study up to date, adding many new observations and summarizing the available data in the form of correlation charts. These charts emphasize the fact that the Permian of West Texas contains a nearly complete sequence of ammonoids and serves well as a standard for the rest of the world.

2. CARL O. DUNBAR (Professor of Paleontology and Stratigraphy, Yale University, New Haven, Conn.).

10:20-10:40—Fusuline Zones in the Late Paleozoic Systems.

3. NORMAN D. NEWELL (Assistant Professor of Geology, University of Wisconsin, Madison, Wis.).

J. BROOKES KNIGHT (Curator of Paleozoic Invertebrates, Princeton University, Princeton, N. J.).

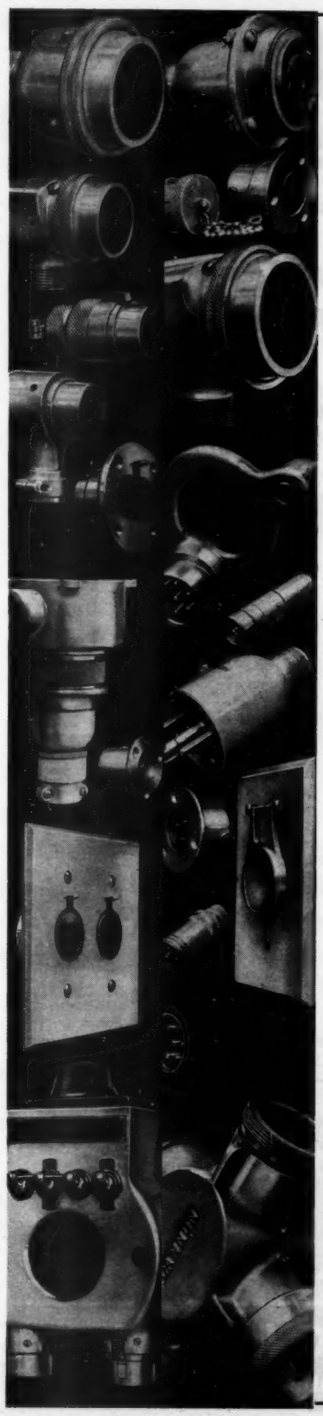
RAYMOND C. MOORE (State Geologist and Director, State Geological Survey, University of Kansas, Lawrence, Kans.).

KENNETH BRILL (Graduate Student, University of Michigan, Ann Arbor, Mich.).

10:40-11:00—Invertebrate Fauna of the Late Permian Whitehorse Sandstone.

For several years the location of the Paleozoic-Mesozoic boundary in the red beds of the Mid-Continent region has been a subject for debate. The controversy has centered on the age of the "Custer" group, as originally defined by Robert Roth. The Custer beds are underlain unconformably by rocks containing faunas indicating either a Leonard or Word age. The Custer group is overlain unconformably by the Dockum beds containing a fauna of terrestrial vertebrates of undoubted late Triassic age. A fauna of marine invertebrates occurs in deposits of cross-bedded sandstone and dolomite in the Whitehorse sandstone of the Custer group. Beede studied this fauna and assigned it to the Permian. Following Beede's conclusion the beds of the Whitehorse generally have been regarded as Permian in age, but some geologists have looked upon Beede's faunal evidence as inconclusive, and have referred the entire Custer to the Triassic.

If the Whitehorse beds could be traced at the surface continuously from northwestern Texas



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into the nearby Guadalupe Mountains of southeastern New Mexico and trans-Pecos Texas, it would be possible to date the Whitehorse sandstone relative to the Permian of the classic Guadalupian section. The red beds of the Whitehorse sandstone and associated strata are covered, however, by late Triassic and Tertiary deposits in much of northwestern Texas, so that continuity in the direction of the West Texas outcrops can be studied only from the records of deep borings.

Texas geologists are not agreed on the subsurface correlations of the Custer beds with equivalents in New Mexico and western Texas. To most workers, however, voluminous subsurface data available indicate that the lower, Whitehorse part of the Custer grades directly into the Delaware Mountain and Capitan limestone of late Permian age. Other geologists interpret the same information differently, concluding that the Custer passes completely over, and is entirely younger than the Capitan formation. According to this view the Custer group, including the Whitehorse sandstone, might be early or medial Triassic in age.

The present investigation is primarily concerned with a restudy of the invertebrate fauna of the Whitehorse formation. The results of this investigation clearly indicate a late Permian age for the fauna. The evidence contributed by the pelecypods, bryzoans, gastropods, and brachiopods is in complete harmony with such a conclusion. Whitehorse species occur in the Azotea tongue of the Carlsbad limestone, so that correlation of the Whitehorse and Carlsbad units seem reasonable. However, geologists familiar with the Guadalupe Mountains are not all agreed as to whether the Carlsbad limestone is equivalent to or younger than the Capitan limestone.

The lithologic facies of the red beds Whitehorse sandstone with its gypsum and salt beds is quite unlike that of the more normal marine sequence of the Guadalupe Mountains; therefore, it is not surprising that the faunas of the two facies are dissimilar. The fact that the faunas are so profoundly different, however, is not necessarily explainable on ecological grounds alone. Many of the genera represented in the Custer fauna are commonly found in non-red calcareous and muddy facies of other regions. The Custer fauna is not simply an impoverished and modified Guadalupian fauna. Presumably the Custer fauna entered the Mid-Continent from the southwest, as did other late Paleozoic faunas. Yet, the commonest Custer species are as yet unknown in the prolific faunas of the Guadalupe or Marathon areas.

Strophomenoid brachiopods are completely absent from the Custer fauna, an anomalous situation when Permian faunas the world over are considered. Productids particularly are characteristic of most late Paleozoic marine faunas, but in the Custer fauna are conspicuous by their absence. The relative abundance of terebratuloid brachiopods and absence of strophomenoids give the fauna a pronounced, though superficial, Mesozoic aspect. The generic make-up of the fauna is clearly late Paleozoic, and no typically Triassic forms are present. Two gastropods, two pelecypods, one brachiopod, and one bryozoan from the total of 33 Custer forms are closely similar to, or identical with, fossils found in the Delaware Mountain and equivalent formations. This suggestion of equivalency, inadequate though it may be, will be more appealing to most geologists than the negative evidence of dissimilarity of the two faunas. Six new genera are described from the Whitehorse fauna, an extraordinary fact when the small number of species is considered. Of these, two are thus far unknown elsewhere. Most of the original generic assignments of the Whitehorse species being incorrect they are now revised in accordance with modern classifications. Although six new species are described, the total number of valid species has not been increased, because 10 previously described forms are now placed in synonymies. Contributions are made toward a better understanding of several previously established genera.

Although the Custer fauna is practically unique among Permian faunas of the world, there are a few vague resemblances to the Kazanian, late Permian, or the Russian platform, and to the Bakmuth dolomites of the Donetz basin, in southern Russia. The resemblances are not sufficiently close, however, to justify more than approximate correlations. One pelecypod bears marked resemblance to a distinctive species from the upper Productus limestone (*Cyclolobus* beds) of northern India.

In summary, the fossiliferous beds (Whitehorse) of the Custer group are certainly late Permian in age. Evidence, both faunal and stratigraphic, indicates at least partial equivalency with the Carlsbad limestone of southeastern New Mexico. The age of the Carlsbad limestone appears at the present time to be controversial. It may be of Capitan or post-Capitan age, but the preponderance of opinion of field and subsurface geologists indicates a Capitan age. The faunal evidence presented here may be interpreted either way, for Capitan, or post-Capitan age for the Whitehorse sandstone and equivalents.

4. CHARLES E. DECKER (Professor of Paleontology, University of Oklahoma, Norman, Okla.).

11:00-11:15—*Didymograptus Protobifidus* in North America.

Differentiated first in England and noted in

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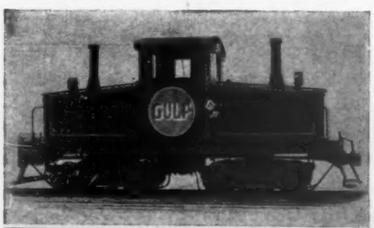

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FIGURE 413

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Australia, the species has been secured from four different outcrops in Oklahoma, and in material sent to the write from Marathon, Texas, and Smithville, Arkansas. It is thought also that this species occurs in the Deepkill of eastern New York. It is purported to describe and illustrate some of the forms from the various American regions and note their stratigraphic importance.

5. CHARLES E. DECKER (Professor of Paleontology, University of Oklahoma, Norman, Okla.), and EDWARD A. FREDERICKSON (Graduate Student, University of Wisconsin, Madison, Wis.).

11:15-11:30—A New Graptolite Horizon in Wisconsin.

It is proposed here to illustrate and describe a single species of graptolite from the Platteville limestone of Wisconsin and present illustrations for comparison of an identical species from the Criner Hills and Arbuckle Mountains of Oklahoma and the Ordovician of Sweden, and present a brief section to show the position of the graptolite horizon in the Platteville limestone.

Edward A. Frederickson

6. H. B. STENZEL (Bureau of Economic Geology, University of Texas, Austin, Tex.), and R. W. CUMLEY (Bureau of Economic Geology, University of Texas, Austin, Tex.).

11:30-11:40—A New Paleontologic Correlation Method.

The gastropod species *Turricula gabbii* (Conrad) is one of the most common fossils of the middle Eocene Claiborne group of East and Central Texas. This species and is ancestors can be traced through about 500 feet of beds. During its evolution the number of riblets on the protoconch decreases from about 188 to 85. This decrease in the number of riblets is so gradual and can be measured to such accuracy that it can be used for an exact correlation of the beds. The results are similar to those obtained from a study of Jurassic ammonites in England.

7. DANIEL J. JONES (Phillips Petroleum Co., Bartlesville, Okla.).

11:40-12:00—Conodont Fauna of the Seminole of Northeastern Oklahoma.

In two preliminary reports on the conodont fauna of the black shale horizon near Collinsville, Okla., presented before the Society of Economic Paleontologists and Mineralogists, the writer has described the fauna as occurring in the Nowata shale. However, recent field work by Dott, Murray, and others has shown that this conodont-bearing horizon lies within the Seminole formation.

The present paper deals with new information obtained recently concerning the significance of the previously reported conodont assemblages, and with the classification of these assemblages into definite groups according to the diagnostic polygnathid form present; each group contains its characteristic suites of conodont pairs. In addition, three new genera of conodonts are erected, together with several new species. These are briefly described and figured.

It is suggested that, due to the fact that the preponderance of the systematic taxonomy of conodonts in the literature has been erected on the basis of the individual form, the classification be continued for the benefit of workers in stratigraphic paleontology, with the understanding that the individual conodont is not the true morphological unit. It must be realized that the true individual, whatever its zoological affinities, possessed many different generic and specific forms within one oral or buccal apparatus. This dual system of conodont nomenclature and classification will, it is believed, satisfy both the morphologic and stratigraphic paleontologists. A proposed morphological classification of the Seminole assemblages is presented in preliminary form, as well as a new simplified grouping based upon characteristics of the individual specimen. These groupings are submitted for suggestion and criticism.

Thursday Afternoon, March 23

PALEONTOLOGY AND MINERALOGY DIVISION

CRYSTAL ROOM, SKIRVIN HOTEL

Technical Session

1:30—3 P.M.

Business Meeting

3 P.M.

8. HELEN TAPPAN (Graduate Student, University of Oklahoma, Norman, Okla.).

1:30-1:50—Foraminifera From the Grayson Formation of Northern Texas.

Ninety species of foraminifera are described and illustrated from the Grayson formation of northern Texas and southern Oklahoma, representing more than double the number of species hitherto listed from this formation. This fauna includes 1 new genus, 33 new species, and 1 new variety. Thirty-nine species of the family Lagenidae were found. with 10 of the Polymorphinidae and nine of the Buliminidae, these three families comprising nearly two-thirds of the entire fauna. The geologic range of the genera *Pseudopolymorphina, Gumbelitria,* and *Schackoina* is extended to include the Lower Cretaceous, and the geologic and geographic ranges of many species are extended. The foraminiferal evidence supports that of the upper Grayson ammonites in the correlation of this formation as upper Albien in age, and the equivalent of the Albien of France and the Gault of England and Germany.

9. ALVA C. ELLISOR (Research Geologist and Paleontologist, Humble Oil & Refining Co., Houston, Tex.).

1:50-2:15—An Interpretation of the Miocene Formation of South Louisiana.

The area under discussion is south of a line drawn from the southern part of Beauregard Parish to the southern part of St. Tammany Parish, extending into Mississippi far enough to include the Gulf's R. J. Williams well No. 1 in Hancock County. A series of eight strike sections and one dip section are given, showing the variation in depositional conditions of the Miocene sediments, the transition of brackish water fauna into Marine, and the faunal zones present which are of no value for correlation. Plates showing the characteristic fauna are included.

10. DONALD W. GRAVELL (Paleontologist, Gulf Oil Corp., Houston, Tex.) and MARCUS A. HANNA (Paleontologist, Gulf Oil Corp., Houston, Tex.).

2:15-2:25—Some New Species of Larger Foraminifera From the Claiborne of Mississipi.

Donald W. Gravell

Marcus A. Hanna

The new species of *Camerina* and one new species of *Lepidocyclina* are described and figured from the subsurface Claiborne Eocene of Mississippi.

11. FLAVY E. DAVIS (Paleontologist, Gulf Oil Corp., Houston, Tex.).

2:25-2:45—Some Species of Textularia From the Tertiary of Texas.

Flavy E. Davis

Fourteen species and varieties of *Textularia* from Tertiary of Texas redescribed and refigured, and six new species and two new varieties described and figured. Discussion of stratigraphic and geologic distribution of these species.

12. J. B. GARRETT (Stanolind Oil & Gas Co., Houston, Tex.).

2:45-3:00—Some Middle Tertiary Smaller Foraminifera From Subsurface Beds of Jefferson County, Texas.

Thirteen new species and two new varieties of smaller foraminifera are described from strata known in the Gulf Coast as the Discorbis, Heterostegina, and Marginulina zones.

13. GROVER MURRAY, JR. (Louisiana State University, Baton Rouge, La.).

By Title—Ostracoda of the Genera *Cytheredeis, Cytheropteron, Loxoconcha, and Brachycythere* From the Gosport Sand, Claiborne Eocene, Claiborne Bluff, Ala.

Grover Murray

Keith M. Hussey

14. GROVER MURRAY, JR. (Louisiana State University, Baton Rouge, La.) and KEITH M. HUSSEY (Louisiana State University, Baton Rouge, La.).

By Title—Some Tertiary Species of the Ostracoda Genera *Brachycythere* and *Alatacythere*.

3:00—Business Meeting.

ENGINEERING and OPERATING

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MARCH 23, 1939

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Determination of Sulfur in Refined Petroleum

By W. A. SCHULZE, V. W. WILSON and A. E. BUELL
Phillips Petroleum Company

A lamp method for the determination of total sulfur in petroleum oils was first issued by the American Society for Testing Materials in 1921. Various modifications of this tentative standard have been made from time to time, but the method has remained essentially the same up to the present (A.S.T.M. Designation D90-34T). Within the past few years other methods embodying the same reaction principles have been advanced; chief among these is the so-called "Ethyl Corporation Method" first published by Edgar and Calingaert[1] and later discussed by Espach and Blade.[2] This method was popularized for routine determinations in many laboratories, since the procedure involved represented a definite improvement over any existent at the time of its publication.

This paper presents modifications of the Ethyl Corp. method which permit the operator to secure consistently reproducible results accurate to a degree heretofore unattained. The principal modification consists in the substitution of a carbon dioxide-oxygen mixture for the stream of purified air ordinarily entering the chimney of the combustion unit. Other variations consist in a lamp of 30 ml. capacity for fuels of low sulfur content, and a double endpoint titration insuring exact neutralization. The net effect of these modifications is to insure the accuracy of the method over the entire concentration range encountered in work with petroleum oils.

Before proceeding with a discussion of the reasons for these alterations, it may be well to review the principal reactions involved in the lamp method.

1. *Combustion in the lamp.*
   (*a*) Hydrocarbon + $O_2 \rightarrow CO_2 + H_2O$
   (*b*) S free or combined + $O_2 \rightarrow SO_2$ and/or SO_3
2. *Absorption in sodium carbonate solution.*
   (*a*) $Na_2CO_3 + CO_2 + H_2O \rightarrow 2\ NaHCO_3$
   (*b*) $2\ NaHCO_3 + SO_3$ (or $SO_2 + 1/2\ O_2$) $\rightarrow Na_2SO_4 + H_2O + 2\ CO_2$
3. *Titration of remaining carbonate solutions.*
   $NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$

Of primary importance are Equations 1(*b*), 2(*b*) and 3, which represent, respectively: the combustion, absorption, and determination of sulfur in the oil burned. The difference between the acid equivalent of the carbonate originally in the absorber and the acid used in 3 represents the sulfur oxides absorbed as in 2(*b*). Therefore this difference is a direct measure of the sulfur content of the oil.

In the presence of air, however, reactions other than those shown in 1 take place in the region of the flame. At the ordinary temperatures realized during combustion of gasoline in air, some nitrogen is oxidized, viz:

4. (*a*) $N_2 + O_2 \rightarrow 2\ NO$
   (*b*) $2\ NO + O_2 \rightarrow 2\ NO_2$
   (*c*) $2\ NO_2 + H_2O \rightarrow HNO_2 + HNO_3$
   (*d*) $2\ HNO_2 + O_2 \rightarrow 2\ HNO_3$

These acid oxides and acids of nitrogen are swept into the absorber with the other products of combustion, where they react with the carbonate solution, thus:

2. (*c*) $NaHCO_3 + HNO_2 \rightarrow NaNO_2 + H_2O + CO_2$
   and/or
   (*d*) $NaHCO_3 + HNO_3 \rightarrow NaNO_3 + H_2O + CO_2$

The sodium salts so formed are unaffected by the titration, and the apparent amount of sulfur oxides formed is greater than that actually present by the amount of nitrogen acids.

It was first noted that where comparatively large (15-20 ml.) samples of *n*-heptane, supposedly sulfur free, were burned a small but definite neutralization of carbonate occurred. Gravimetric sulfur determinations on this product were unsatisfactory, due to unavoidable traces of silicates and other extraneous substances. Therefore, in an attempt to locate the difficulties in the titrametric procedure, analyses were made of the carbonate gases. Nitrates were found; the source was the nitrogen oxides formed during the combustion of the hydrocarbon oil in an air atmosphere.

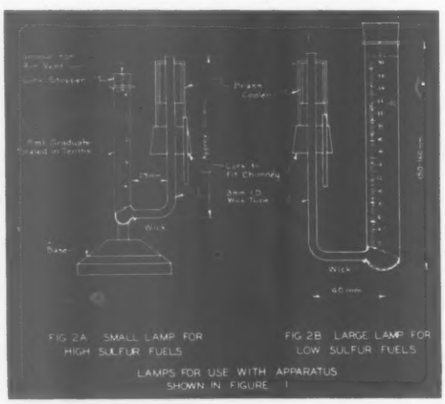


FIG 2A SMALL LAMP FOR HIGH SULFUR FUELS

FIG 2B LARGE LAMP FOR LOW SULFUR FUELS

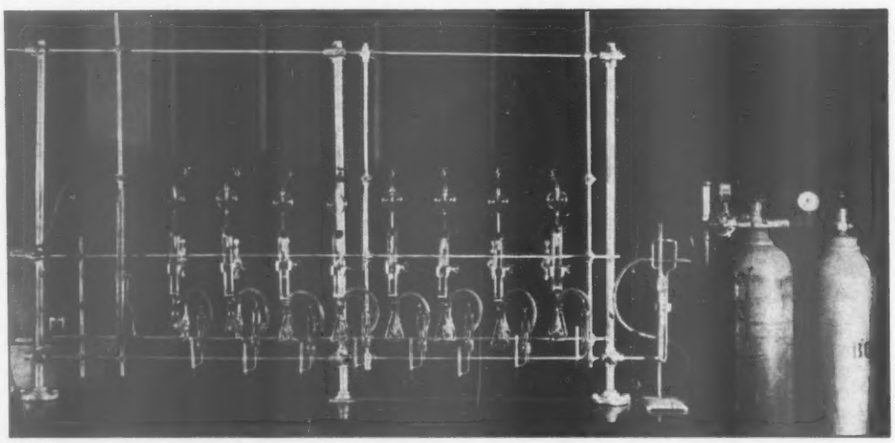
LAMPS FOR USE WITH APPARATUS SHOWN IN FIGURE 1

A series of experiments involving the determination of sulfur by the lamp method and subsequent quantitative analysis of the neutralized solution for nitrates[3] showed that the amount of nitrates varied from one analysis to another. This was to be expected since the amount of nitrogen converted to the oxide form is a function of the flame temperature. Therefore, it was evident that if the sample were to be burned in air it would be necessary each time to determine the amount of nitrates which had been formed during the combustion. The procedure for determination of nitrates is long and tedious, and in the higher nitrate concentrations demands exceptional care to obtain accurate results.

The substitution of a carbon dioxide-oxygen atmosphere for combustion then has a two-fold advantage: First, it eliminates the troublesome purifying tube through which air must be passed. Second, and more important, it provides an atmosphere for combustion of the oil without the attendant formation of nitrogen oxides, thereby eliminating the long tedious step of determination of nitrates.

Since commercial oxygen usually contains 0.25-0.5 per cent nitrogen as an impurity, it is not possible to use an atmosphere of such oxygen without the diluent carbon dioxide. With oxygen alone the flame temperature is so high that this fractional per cent of nitrogen is sufficient in quantity to give appreciable amounts of nitrogen oxides.

Commercial welders' oxygen and "bone-dry" carbon dioxide have been used as sources of supply of the artificial atmosphere. These are connected through ordinary pressure regulators to wet test meters for measuring the volumes of each gas, and thence to a chamber where the two gases are thoroughly mixed. The mixing chamber is connected to the gas intake manifold on the sulfur as-



Apparatus used in determining sulfur content by carbon dioxide-oxygen method

Light Oils

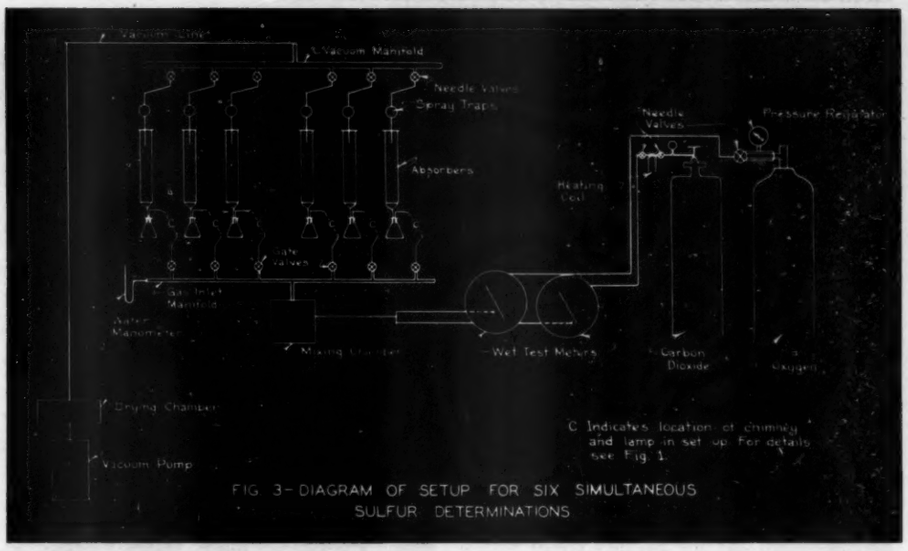


FIG. 3—DIAGRAM OF SETUP FOR SIX SIMULTANEOUS SULFUR DETERMINATIONS

sembly, which in turn supplies each chimney with the requisite amount of the mixture.

With tightly fitting corks supporting the lamps in the chimneys, the system is now entirely closed to outside air, and once it has been flushed (at the beginning of the run), will no longer be affected by laboratory air conditions. This is of considerable benefit where determinations must be made in an atmosphere contaminated with sulfur compounds. A slight positive pressure, measured on a water manometer, is maintained in the combustion chamber.

With the equipment as described, a few representative fuels were analyzed for sulfur, first in air, then in carbon dioxide-oxygen atmosphere. In the former instance a supplementary analysis for nitrates was carried out in order to determine, quantitatively, the magnitude of the error introduced by the nitrogen content of air. Comparative data from the two methods are recorded in Table 1.

TABLE 1—SULFUR CONTENT OF GASOLINE BY AIR AND CARBON DIOXIDE-OXYGEN METHODS

	Air method			
Fuel—	% sulfur (Uncorrected)	% nitrate*	% sulfur (Corrected)	CO_2-O_2 method % sulfur
Reference Fuel 1	0.0110	0.0060	0.0050	0.0050
Gasoline A	0.0138	0.0049	0.0089	0.0096
Reference Fuel 2	0.1010	0.0032	0.0978	0.0970
Natural gasoline	0.0340	0.0040	0.0300	0.0295

*Nitrate nitrogen expressed in sulfur equivalents.

It is to be noted that the results obtained in the case of air combustion are in every case higher than those obtained in carbon dioxide-oxygen mixtures. Good agreement is had, however, between the corrected "air" values and the CO_2-O_2 values.

The 30 ml. lamp for low sulfur fuels and the double endpoint titration are described adequately in the accompanying section on the procedure. The former is used in case of low sulfur fuels where 10-20 ml. must be burned to afford appreciable amounts of sulfur oxides. The double endpoint titration so completely eliminates the difficulties had by most operators in determining methyl orange endpoints that greater accuracy is now possible.

Applicability of Modified Method

The applicability of the revised method to fuels of various gravities and the degree of precision of the method is amply illustrated by the data in Table 2.

It is of interest to note that in the case of Fuel K when six samples were burned, the average percentage of sulfur found was 0.1820 and the maximum deviation from this value amounted to only 0.001 per cent. Such precision can be obtained only by observing all the precautions set forth in the procedure, along with constant supervision during the burning process. The success of the method with fuels of such widely varying sulfur contents and distillation characteristics gives an indication of the scope of the method.

The question has arisen as to the effect of nitrogen compounds present in the oil, such compounds being either of natural origin or in the form of color and gum inhibitors. No naturally occurring nitrogen has been found thus far in Mid-Continent and eastern gasolines. It is true that certain California gasolines contain natural nitrogen compounds but none of these gasolines were investigated in this study. If gasolines contain nitrogen compounds, they may be burned in the CO_2-O_2 atmosphere herein described but nitrate determinations should be made on the samples after titration, since a portion of the nitrogen present is oxidized. This has been shown by analysis of a number of synthetic blends of a sulfur-containing fuel with various nitrogen compounds in comparatively high concentrations. The sulfur content of the fuel was constant. The analytical results are given in Table 3. Inspection of the preceding table reveals good agreement between corrected sulfur values from the nitrogen-containing samples and those from the nitrogen-free sample.

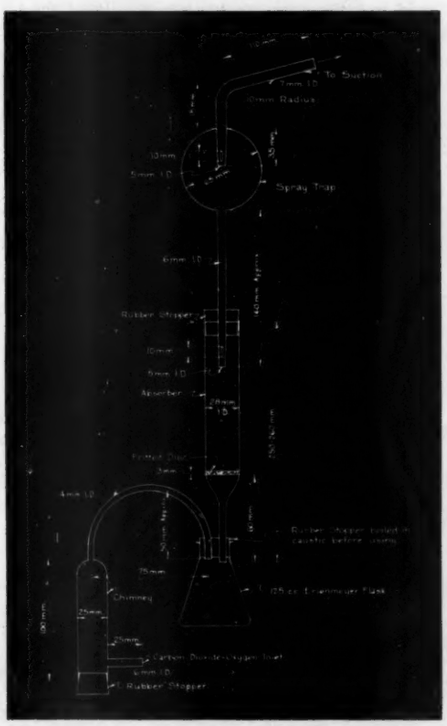


Fig. 1—Glass apparatus used for determination of sulfur in oils (after Edgar and Calingaert)

Range of Application

This method is applicable to the determination of total sulfur in gasoline, kerosene, petroleum naphtha and other petroleum oils which can be burned cleanly and completely in a wick lamp. The procedure can be extended to heavy fuels of the gas oil type by blending with a naphtha of known sulfur content and arriving at the percentage sulfur in the heavy fuel by difference. Highly volatile gasolines, if kept at ice temperature, can be burned satisfactorily.

Apparatus

The equipment, necessary for the burning and absorption of the products of combustion from a sample of gasoline, is fabricated from chemically resistant glass and includes the following separable parts: (1) an absorber containing a fritted glass disc having a pore diameter of 40-50 microns,* (2) a chimney, (3) an Erlenmeyer flask, (4) a spray trap, (5) lamps of variable capacity. Details of assembly of the component parts along with their specific dimensions are adequately described in Figure 1. A lamp to be used in burning fuels containing more than 0.03 per cent sulfur is described in Figure 2-*A*, while fuels containing less than this amount of sulfur should be burned in the lamp shown in Figure 2-B. The wick used in both lamps should consist of two or three strands of cotton wicking in a woven cotton jacket, of sufficient length to fit the wick tube exactly. It should be emphasized that the radiation coil must fit the wick tube closely at its uppermost point and that the cork stopper must fit the wick tube snugly.

The absorbers and accompanying apparatus can be conveniently set up in multiple, with a gas inlet manifold as a distributing system for the carbon dioxide-oxygen mixture. A vacuum manifold equipped with needle valves for the independent regulation of suction on each absorber is a necessary adjunct. Banks of 6 to 10 absorbers may be used successfully. The details of one such assembly is represented in Figure 3. The artificial combustion atmosphere used in this method is 27-30 volume per cent oxygen in carbon dioxide. To avoid appreciable error the oxygen must be at least 99.5 per cent pure and the carbon dioxide is that designated as bone-dry.

Reagents Required

The following reagents are employed: (1) Sodium carbonate solution, 0.05 *N*, (2) hydrochloric or sulfuric acid, 0.05 *N*, (3) methyl orange solution. The exact normalities indicated above can

be conveniently prepared by diluting 0.1 *N* Fixanal preparation to exactly 2000 ml. It is essential that 10 ml. of acid neutralize exactly 10 ml. of sodium carbonate solution. The indicator solution is prepared by dissolving 0.2 grams of methyl orange in 100 ml. of distilled water.

Procedure

Cleaning absorbers. — In operating practice, after 5-8 determinations or after the fritted plate is smoked, the absorber is cleaned with acid-bichromate cleaning solution to remove accumulated grease, carbon or foreign material. Following this treatment the absorber must be thoroughly rinsed with distilled water until two successive tests with methyl orange show the fritted plate to be acid free.[5] However, in the case of consecutive analyses where no smoking has occurred it is merely necessary to rinse the absorber with distilled water and connect a clean Erlenmeyer flask to the assembly as in Figure 1.

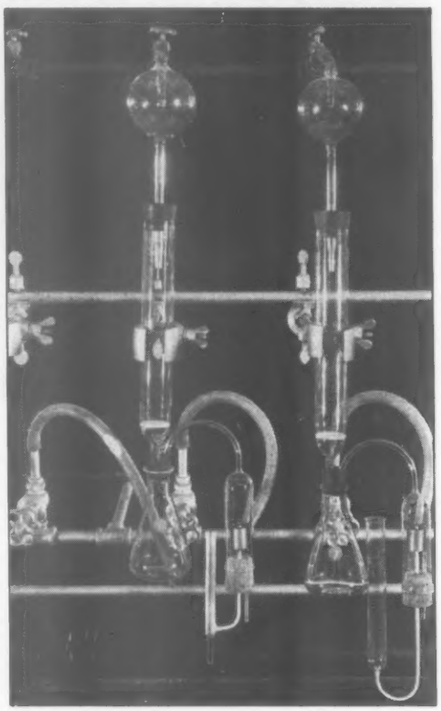
Adjustment of pressure.—With the absorber unit assembled and the chimney closed with a clean rubber stopper (Figure 1), a slight flow of carbon dioxide-oxygen mixture is admitted to the system. Approximately 10 ml. of distilled water and exactly 10 ml. of 0.05 *N* sodium carbonate solution is pipetted into the absorber, the liquid being held in the absorber by the pressure of gas against the fritted plate. The spray trap is then connected to the vacuum line and inserted into the absorber so that a gentle flow of oxygen-carbon dioxide mixture is maintained through the fritted plate. Final adjustment of the pressure is now effected so that a slight positive pressure is maintained on a manometer connected with the gas manifold.

Burning of sample.—A clean and dry lamp is obtained by rinsing with sulfur-free benzene followed by ether. At least 5 ml. of each cleaning agent should be drawn through the wick by means of suction on the upper end of the wick tube. The brass coolers are cleaned with a cloth dampened in benzene. In practice this cleaning operation is carried out at the end of each analysis. The oil sample to be analyzed is poured into the clean and dry lamp, filling the lamp above the graduated portion to allow for the volume necessary to saturate the wick. The lamp is then lighted and the brass cooler adjusted so that a clean, nonsmoking flame results. The rubber stopper in the chimney is removed and the lamp immediately inserted after reading the liquid level, which is then recorded. The lamp is held in place by the cork used to support the cooler (see Figure 2).

If the flow of carbon dioxide-oxygen mixture is properly maintained a freely burning nonsmoking flame is produced. The height of the flame, which should be about 10 mm., is regulated by raising or lowering the wick tube in relation to the cooling coil. Under ordinary circumstances the fuel should be burned at the rate of 2-4 ml. per hour. When the small lamps are used, 4-5 ml. of oil should be consumed and in the case of low sulfur oils 10-25 ml.

For accurate results certain precautions must be observed during combustion of the sample. Thus, if the sulfur content of the fuel is suspected to be in excess of 0.15 per cent, 20 ml. or more of carbonate solution should be added to the absorber. It is essential to have at least 2 ml. of carbonate solution remaining in the absorber at the conclusion of burning. If such is not the case the analysis must be discarded because of incomplete absorption of sulfur oxides. Furthermore, if the flame smokes even to a slight extent, the results will be inaccurate. Also, if the solution in the absorbers becomes discolored during burning or has a syrupy appearance the results are not valid.

Removal of carbonate solution from absorbers. When the requisite amount of oil has been burned, the lamp is removed, the flame extinguished and the liquid level immediately read and recorded. The room temperature at the lamp must also be read in order that the specific gravity of the oil may be corrected to this temperature.



Close-up of two types of lamps used in making sulfur determinations

The spray trap is disconnected from the vacuum line and the liquid in the absorber is allowed to drain into the flask. The spray trap and stopper are carefully rinsed with distilled water into the absorber and the washings allowed to drain through the fritted plate. The absorber is then thoroughly washed including the bottom of the fritted plate and the rubber stopper, all of the washings being added to the Erlenmeyer flask. The chimney is likewise rinsed. The total volume of solution and wash water should not exceed 75-80 ml.

Titration.—A reference blank is prepared by pipetting a 10 ml. portion of the standard carbonate solution into a clean 125-ml. Erlenmeyer flask with subsequent dilution to the same volume as the analytical samples. Two drops of methyl orange indicator are added and the solution neutralized with 10 ml. of 0.05 *N* sulfuric acid. A distinct color difference is noted between the reference and the analytical sample to which methyl orange is added. The analytical sample is then titrated with acid until the color of the solution matches that of the reference blank. Since matching the true methyl orange endpoint in dilute solutions is difficult for most operators a second endpoint is resorted to in an effort to remedy this error. After recording the burette reading at the first endpoint, two drops of acid are added to the reference blank which assumes a deeper orange shade much more easily matched than the true endpoint. Acid is then added dropwise to the analytical sample counting the number of drops and estimating to the fraction of a drop the amount required to produce the same orange coloration as in the reference blank. The burette need not be read provided it has been calibrated previously for its drop delivery. If the true endpoint has been overstepped, less than two drops will be required and the difference in volume must be subtracted from the true endpoint reading. If more than two drops are required the endpoint of the original titration was stopped short of the true endpoint and the difference in volume must be added to the original reading.

The sulfur content of the oil is calculated by substituting the proper values in the following formula:

$$\% \text{ Sulfur} = \frac{\text{ml. } H_2SO_4 \text{ for blank} - \text{ml. } H_2SO_4 \text{ for sample} \times .08}{\text{ml. oil burned} \times \text{sp. gr.}}$$

This formula is true only for the .05 *N* solutions. If other strength solutions are used, the appropriate equivalence factor must be employed.

Precision

Duplicate determinations should not differ by amounts greater than those given in the following tabulation:

Per cent sulfur—	Deviation from mean
Under 0.03	.0005
0.03-0.07	.0010
0.07 and higher	.0015

Bibliography

1. Edgar and Calingaert, Ind. Eng. Chem., Anal. Ed. 2, 104-6 (1930).
2. Espach and Blade, Bur. Mines, Tech. Paper 513, 22 pp. (1931).
3. American Public Health Assn., "Standard Methods of Water Analysis," Sixth Ed., (1925), p. 20.
4. Absorbers having a suitable porosity are listed by the manufacturer as G3-5.
5. The importance of having thoroughly clean apparatus becomes apparent when the amount of sulfur determined is considered. In a 5-ml. sample of 0.1 per cent sulfur content less than 4 mg. of sulfur are present. The inclusion of the slightest trace of extraneous acids or bases is sufficient to vitiate an entire set of results.

TABLE 2—DETERMINATION OF SULFUR CONTENT OF FUELS BY CO_2-O_2 METHOD

Low sulfur content*			Average sulfur content			Gas oil blends† of 750° F. endpoint		
Fuel	ml. burned	% sulfur	Fuel	ml. burned	% sulfur	Fuel	ml. burned	% sulfur
A	16.60	0.0016	E	4.71	0.0946	J	4.45	0.1782
A	20.20	0.0016	E	4.66	0.0932	J	4.28	0.1809
B	4.96	0.0374	F	4.73	0.0648	K	4.68	0.1820
B	5.04	0.0379	F	4.86	0.0652	K	4.82	0.1825
C	4.78	0.0372	G	4.59	0.0623	K	3.68	0.1819
C	4.91	0.0370	G	4.54	0.0614	K	3.78	0.1810
D	16.00	0.0000	H	4.98	0.0577	K	4.55	0.1819
D	16.80	0.0000	H	4.89	0.0573	K	4.60	0.1825
D	15.90	0.0000						

*Highly volatile samples were cooled in an ice bath during combustion.
†Blended with naphtha of low sulfur content.

TABLE 3—EFFECT OF NITROGEN COMPOUNDS ON THE DETERMINATION OF SULFUR IN GASOLINE

Sample	Fuel	N source—	Per cent N added	Wt. of sample burned, grams	Per cent sulfur (uncorrected)	mg. N found	Per cent sulfur (corrected)
1	A	None	0	3.52	0.0250	0	0.0250
				3.24	0.0253	0	0.0253
2	A	Pyridine	0.1	3.10	0.0338	0.25	0.0245
				3.31	0.0341	0.25	0.0254
3	A	*n*-Butylamine	0.1	3.49	0.0390	0.42	0.0252
				3.03	0.0361	0.33	0.0236
4	A	Acetonitrile	0.1	3.42	0.0248	0.03	0.0237
				3.41	0.0247		
5	A	Pyridine	0.5	3.66	0.0393	0.45	0.0252
				3.49	0.0437	0.62	0.0233

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Effect of Capacity on the Cost of a Cracking Plant

By W. L. NELSON

Everyone is aware that the per-barrel cost of any plant equipment is lower for large plants than for small plants providing that the size is not so large as to prevent fabrication in standard shops or require the purchase of special equipment. However, even a 750-bbl. cracking plant is large as compared to small distillation plants and hence the effect of capacity on cost is not as great as for the more simple plants. Cracking plants are large or elaborate for their capacity because of the large amount of oil that must be recirculated through the system for the cracking reaction.

The type of plant studied herein, is the distilled-oil recirculation type. The cost of black-oil recirculation plants will be somewhat higher although the choice of contractor may be even a more important consideration from the standpoint of cost. Three plants operating on a 24 A.P.I. Mid-Continent reduced crude oil, were designed for capacities of 750, 1,500 and 3,000 bbls. per day of reduced crude oil—and in addition two other designs of 1,500-bbl. plants operating on 21 and 27 A.P.I. stocks, were introduced in some comparisons. All of the plants were designed for the same general operating conditions and of comparable materials. The general breakup of construction costs are given in Table 1. Such capacity items (1, 2, 3, 4, 5, 7 and 13) as stills, towers, condensers and insurance, all constitute larger percentages for the 3,000-bbl. plant but by no means in direct ratio to plant size. In fact, in the case of pumps and piping the percentages of the total cost of the 3,000-bbl. plant is scarcely larger than for the smaller plants. Other items (6, 8, 9, 10, 11 and 12) such as instruments, tools, drafting and supervision are no greater for a large plant than for a small plant and hence they constitute a smaller percentage of the total cost of the 3,000-bbl. plant than for the smaller plants.

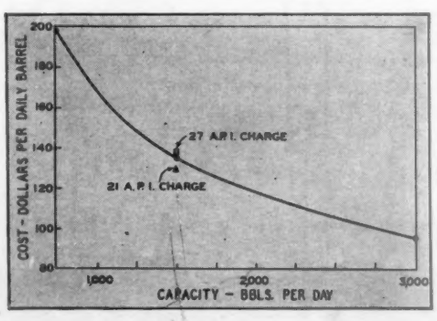

Fig. 2—Cost of cracking plants per barrel capacity (24 A.P.I. charge stock)

The cost of plants as a function of capacity is indicated in Figures 1 and 2. The first of these shows cost as a function of reduced crude capacity and of total furnace charge capacity and Figure 2 shows dollars per daily barrel of capacity versus total capacity. The basis of furnace charge, as shown in Figure 1, is more consistent than a basis of plant charge. Note that the effect of gravity is nearly eliminated by using the preferred basis.

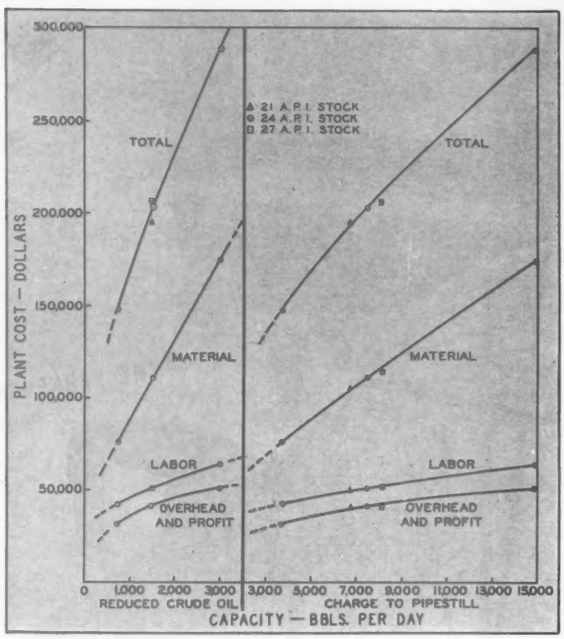

Fig. 1—Cost of cracking plants (24 A.P.I. stock except as noted)

Conditions in Small Plant

In addition to the high cost of a small plant, such a plant is also penalized during operation by high supervision costs. This is indicated in Table 2, part of which was taken from a previous article.[1]

In order for the small refiner (750 bbls.) to make a profit of 10 cents a barrel from his operations he would have to obtain reduced crude oil at a price of about 47 cents rather than 55 cents a barrel. Or the same result could be accomplished by selling his raw gasoline at about 4⅜ cents rather than 4 cents per gallon. The latter would be almost an impossible situation to attain because 4.38 cents plus treating costs is more than the market will normally bear.

TABLE 1—ITEMIZED PERCENTAGE CONSTRUCTION COSTS

	750 bbls. (per cent)	1,500 bbls. (per cent)	3,000 bbls. (per cent)
1. Pipestill, stack, etc.	20.5	25.2	27.2
2. Fractionating tower and shell vessels	7.1	8.3	9.1
3. Heat exchangers	1.1	1.7	2.5
4. Condensers and coolers	5.5	7.4	9.7
5. Pumps	8.6	8.8	8.9
6. Pumphouse, etc.	1.8	1.7	1.5
7. Pipe, valves and fittings	12.1	12.2	12.2
8. Instruments	3.7	3.2	2.4
9. Utilities	1.1	0.9	0.6
10. Tools, etc.	0.7	0.6	0.4
11. Supervision and operation	3.4	2.8	2.1
12. Drafting	2.1	1.7	1.3
13. Insurance, liability, etc.	4.3	4.5	4.7
14. Overhead and profit	28.0	21.0	17.4

TABLE 2—COST BALANCE OF CRACKING PLANT OPERATION (1,500 BBLS.)

	V	I	II	III	IV
Capacity, bbls. per day of reduced crude	750	1,500	1,500	1,500	3,000
Gravity of charge stock, A.P.I.	24	21	24	27	24
Value of charge stock, cents per barrel	55	50	55	60	55
Cost of plant	$148,908	$195,049	$203,310	$206,643	$288,816
Value of products, per year:					
Raw gasoline at 4 cents per gallon	$218,000	$395,000	$436,500	$478,000	$860,000
Fuel oil at 50 cents per barrel	62,500	141,000	125,000	109,300	250,000
Total	$280,500	$536,000	$561,500	$587,300	$1,110,000
Cost, per year:					
Operation*	$123,000	$202,000	$223,400	$242,500	$420,000
Value of charge stock	151,000	274,000	302,000	330,000	604,000
Total	$274,000	$476,000	$525,400	$572,500	$1,024,000
Profit:					
Dollars per year	$6,500	$60,000	$36,100	$14,800	$86,000
Cents per barrel charge	2.4	10.9	6.6	2.7	7.9

*Supervision and labor $63 per day for all plants or 4.2 cents per barrel based on 1,500-bbl. charge. Heat, power, etc., 12 cents per barrel of stock charged to furnace. Depreciation and fixed charges—6 per cent interest retired in 10 years.

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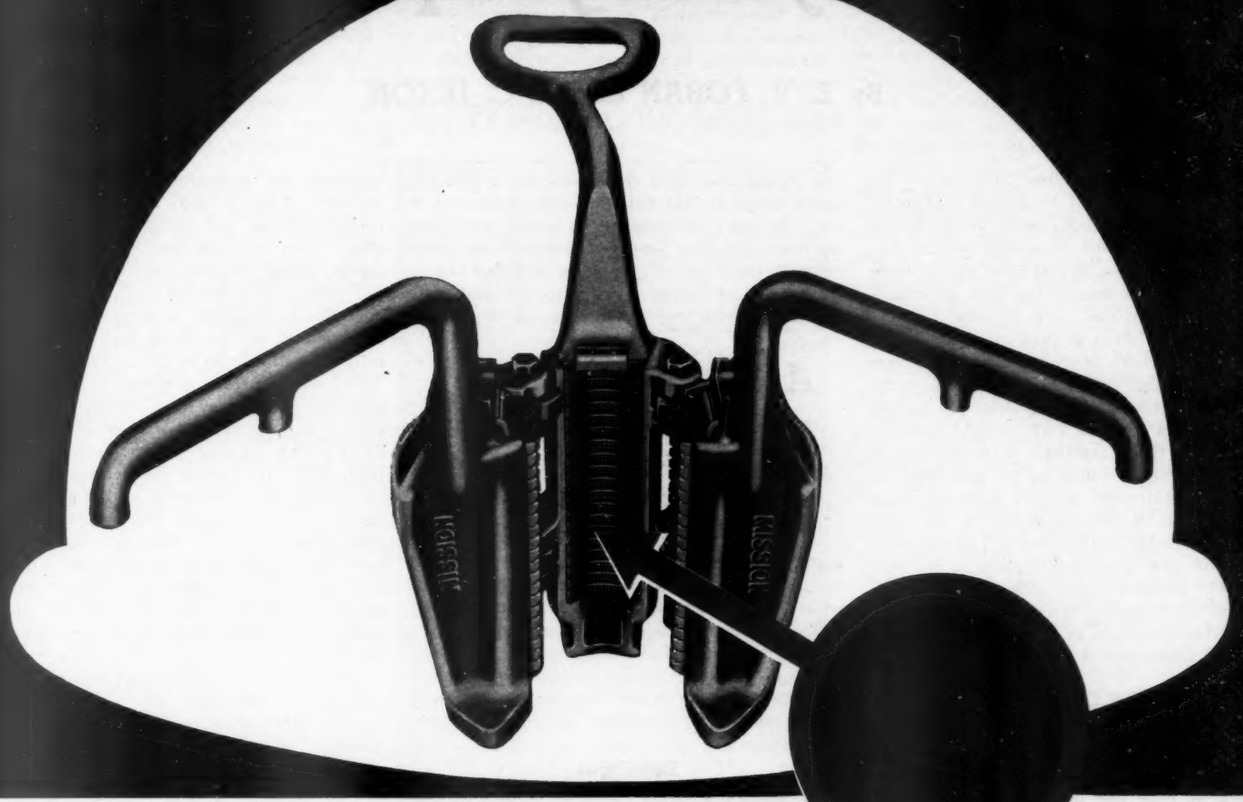

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Condensate Wells---Completion and Recycling Operations

By E. V. FORAN and P. C. DIXON
Consulting Engineers, Parker, Foran, Knode & Boatright,

In November 1932, before the A.P.I. members assembled in annual convention at Houston, Dr. William N. Lacey, in his discussion of a paper[1] there presented, stated that " . . . at high pressures, liquids have higher vapor pressures than is ordinarily the case. At considerably higher pressures, such as 3,000 to 4,000 pounds, . . . that effect is quite marked. Liquids which ordinarily have fairly low vapor pressures have relatively high ones under these conditions; . . . that under these conditions, about 185 degrees temperature and 3,000 to 4,000 pounds pressure, the upper zone (Big Lake field) with its white oil is existent in the formation in the gas phase entirely." This statement startled some of those present because it was contrary to the well-accepted knowledge of the laws of physics when dealing with wet hydrocarbon gases in the relatively lower pressure ranges (500 to 800 pounds). It required several years to appreciate the significance of this statement as applied to the single-phase type high-pressure pools under discussion in this paper.

The retrograde phenomena, as Doctor Lacey stated at that time, was not new to science, but it remained for the very able research staff of A.P.I. Project 37 to finally publish a primer of the work in 1933[2] and to continue the dissemination of valuable scientific data on the subject from time to time thereafter. As was forecast by Doctor Lacey in 1932, the "water white oil" present in the gas cap, overlying and in permiable contact with the dark oil in the Big Lake field in West Texas, was entirely in the gas phase in the reservoir. Since that time, as the drill has penetrated deeper in other parts of the state and in other states we have come to accrue an enormous reserve of this material, the production and processing of which has presented new problems to the industry. Present in the gas phase by virtue of the original reservoir pressure and temperature, it has been necessary to evolve a plan, which the industry has chosen to call recycling, in order to preserve the pressure while effecting recovery of these liquefiable reservoir contents. To be economical, the extent of recompression of the residue gas had to be minimized and so the industry has developed new processes whereby liquid recovery is made at pressures that were formerly confined to laboratory practice.

Terminology

Terminology to suit this new phase of the production industry has been slow of formulation. Often referred to in the past as water white oil, the product obtained from these wells was later called distillate, or sometimes condensate, and the wells themselves were known as water white, distillate, or condensate wells. The term water white we now recognize as erroneous in the general sense, for not all of these vapor phase mixtures condense to yield a water white or colorless liquid. The name condensate has found frequent usage of late but it is often awkward in our customary phraseology. It would seem that distillate is a very proper name since the material is present in the gas phase probably due to the process of retrograde vaporization, and truly either the recovered product or the liquefiable material in the vapor phase is a distillate. Of late, occasional reference is made to distillate wells as "combination wells," but to name a well "combination well" is definitely erroneous if the reservoir material is of a single phase. The name was coined by the Bureau of Mines to properly describe a well in which the reservoir material was predominately gaseous although definitely two phase.

A.P.I. — **Presented before meeting Southwestern District, Division of Production at San Antonio, Texas, March 16-17, 1939.**

Definitions

Retrograde pressure condensation is a process wherein a condensate is procured by pressure reduction at constant temperature; retrograde pressure vaporization is the reverse of this process. Retrograde temperature condensation is a process wherein a condensate is procured by temperature increase at constant pressure; retrograde temperature vaporization is the reverse of this process. Current literature is sometimes vague in referring to the retrograde phenomena and not infrequently definitions set forth are erroneous. Normal condensation resulting from temperature drop is not a retrograde phenomena even though it may occur at pressures within the range wherein the phenomena of retrograde pressure condensation or vaporization is observed.

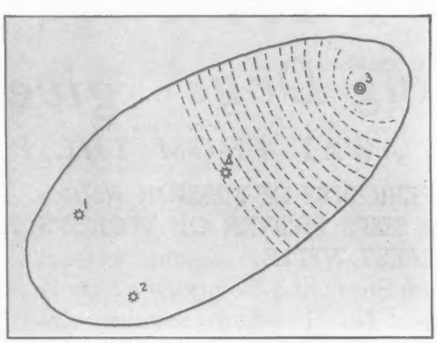


Fig. 1—Recycling well pattern

Methods of recovering distillate from gas at relatively low pressures were well known prior to 1934.[3] Early in 1935 it became necessary to commence deep gas lifting of dark oil and salt water from the 8,800-foot horizon at Big Lake, the gas being obtained from the 8,200-foot or upper water white horizon. It was desirable in an operation of this sort to minimize the degree of compression of the lifting gas, which mechanically of itself offered no difficulties, a single stage 2,000-pound working pressure compressor being used and operated at intake pressures up to 1,200 pounds and discharge pressures of from 1,400 to 2,000 pounds. During the course of these operations many interesting observations were made concerning the recovery of distillate at high pressures. Hydrate freezing was encountered in the compressor discharge lines and this trouble was overcome by following the example of Oklahoma City operators by lubricating alcohol and other materials into the lines. Observations were also made of the effect of temperatures and pressures on the recovery of the "water white oil."

The success of these high-pressure operations practiced at Big Lake was so impressive that early in 1936 preparations were made for the construction, in the Agua Dulce field, of the first distillate recycling plant in Texas. Today there are several distillate recycling plants in operation, most of them making recovery by means of condensation due to retrograde pressure and normal condensation, and so properly called "condensation" plants. Operating pressures in these plants are reported as high as 2,800 pounds and input recycling pressures as high as 3,600 pounds.

Present Status

Currently, considerable interest is being evinced in this work, additional recycling operations being planned in several fields. A recent order by the Texas Railroad Commission has done much to stimulate this activity, shutting in those wells which have heretofore been wantonly blowing gas to the air, and thus assuring operators that reservoir pressures will not be allowed to abruptly decline and precipitate in unrecoverable condition the very product presently anticipated as a recoverable reserve.

Production and Recycling of the Gas

A distillate or condensate well, to use oil country terminology, is in reality a gas well; the contents of the reservoir from which the well produces is entirely gaseous until it undergoes change of pressure or temperature. The pressure drop obtained when flowing one of these wells will be, as a minimum, the difference between bottom-hole and closed-in well head pressure. The temperature drop is variable and depends upon the establishment of an equilibrium condition wherein the ground surrounding the well bore continually absorbs a constant quantity of heat, the flowing well head temperature being as a

minimum approximately 40° F. cooler than the reservoir. Most distillate bearing gases are individually peculiar in their reaction to changes of temperature and pressure, and for given conditions the amounts of condensate will vary, but they all share the common characteristic of issuing from the well head partly in the liquid phase.

It is advantageous to deliver the raw well effluent to the separator or processing plant at a pressure substantially equal to the shut-in well pressure, so that pressure drop to the processing pressure may supply a portion of the necessary process cooling. For this reason the well should be completed and later produced in such a manner that the pressure drop, measured as the difference between casing and tubing pressure, may be as low as 50 pounds per square inch when the well is delivering, for example, 10,000,000 cu. ft. of gas per day.

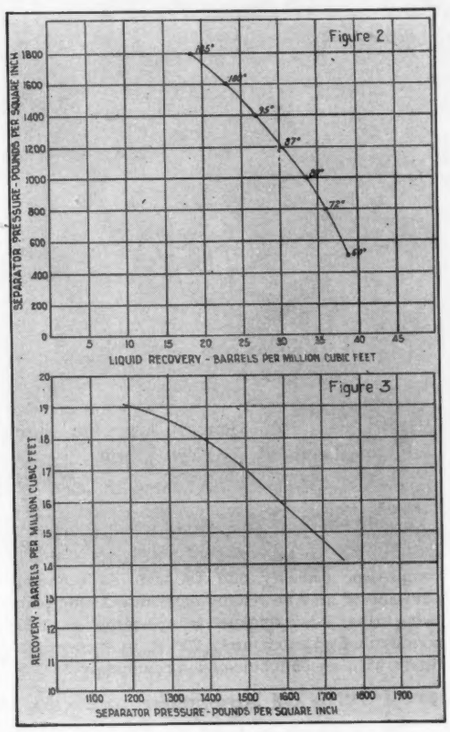
In order to properly minimize the flowing pressure loss it is necessary to set large casing on top of the producing sand and to complete the well with a liner and screen through the producing horizon, if the horizon is unconsolidated, or with an open hole if the horizon is consolidated. Gun perforations have been found unsuited for proper completion of distillate wells. The low potential of many wells completed by gun perforations has been assigned to the facts that only a limited area of sand is exposed for production, that the penetration of the bullet may possibly compress and so materially reduce the effective permeability of the formation about each shot hole, and that by setting and cementing pipe through the productive horizon a small amount of squeeze cementing may take place to reduce the effective formation thickness. One type of efficient completion in an unconsolidated formation is to set the casing on top of the producing horizon, drill into and underream the pay and set a screen with gravel pack.

Tubing is installed in output or recycling input wells for two reasons: First, to provide a syphon string to produce liquid condensate, and second, to provide the normal and necessary means of access and control of the well. Under normal operation flow from output wells is taken from the casing, periodic condensate removal being accomplished by closing in the casing and flowing through the tubing, which is set close to bottom. The size tubing to be used should be carefully considered for each installation; several factors will enter a proper consideration.

It is well at this point to clarify a fact that seems to be rather generally misunderstood. Since all distillate wells produce a two-phase product at the well head they have been held by some to be oil wells; they have even been described as having varying gas-liquid ratios under varying flow rates, which at first thought would appear to be proof of a two-phase material in the reservoir. If a true distillate bearing gas is produced into an efficient separator at constant conditions of temperature and pressure, the gas-to-liquid ratio will remain constant regardless of the rate of flow, but providing that the velocity of the gas through the tubing or casing at the minimum rate of flow is sufficient to insure at all times a steady or nonfluctuating production.

It is possible by mechanical means, such as bottom-hole chokes, or by changing the rate of flow to vary the gas-liquid ratio of the well head product; but these changes in no way affect the true composition of the well stream or of the single-phase material entering the well bore, providing, of course, that the well is not flowed at such a great rate as to cause condensation of material in the reservoir before reaching the well bore. The phase composition of the total material issuing from the well head will vary with the particular conditions of temperature and pressure which exist at the moment. The composition of the composite material, however, will remain unchanged, although analysis is impossible of more than approximate determination except by separation of the entire flow stream into gas and liquid phases for separate determinations of composition and proportion.

The process of condensation which has been described as taking place while in transit within the well is continued in the flow line from the well to the processing plant. Flow lines may well be generously proportioned to minimize pressure loss for the same reasons as cited for minimizing pressure loss by proper well completions. Flow lines may be set on piers above ground to minimize corrosion, but in so doing provision must



(Upper) ***Fig. 2—Graph showing combined effect of temperature and pressure reduction on light recovery.*** **(Lower)** ***Fig. 3—Graph showing effect of pressure on separation recovery, temperature constant 60°***

be made for expansion and contraction movements and the plant process must be flexible enough to compensate for the great differences of incoming gas temperature. Cooling devices may be installed in flow lines between the processing plant and the input well to remove part of the heat of compression and so reduce friction pressure loss, or to achieve the same results, the lines may be telescoped. The design of flow lines is a matter of exact economic determination, balancing the cost of incoming lines against the cost of cooling capacity and the cost of outgoing (input) lines against the cost of compressor capacity.

Input wells are completed in the same manner as output wells and for the same reasons. Experience indicates that the pressure drop between well head and bottom-hole pressure will be the same on a properly completed input well when returning gas to the formation as it would be if the flow were reversed and the well converted to an output well. It is of greater importance to secure good input wells than it is to secure good output wells because, first, it is usually cheaper to purchase cooling than it is compression, and second, the output wells will ordinarily outnumber the input wells and so be called upon to pass less gas.

Development Pattern

In a recycling project all of the wells should be located to conform to a carefully planned pattern. Consider the mechanics of the recycling operation illustrated in Figure 1 and assume for the moment that the structure has been defined possibly by deeper drilling for oil. Assume further that a study of available reserves and other data indicate the advisability of constructing a recycling plant of 30,000,000 cu. ft. daily capacity. Wells No. 1 and 2 are planned to be completed and operated as output wells, returning the denuded gas to the formation through well No. 3. In such an operation, assuming continuity of formation and reasonably uniform permeability, the recycled gas would travel in the formation somewhat as pictured by the dotted lines and would displace en masse the original reservoir contents toward the output wells. By such an operation maximum recovery may be made before the lean displacing gas commences a second cycle. If a third output well (No. 4) were to be located as shown, the displacing gas would begin a second cycle via well No. 4 at a time when less than one-half of the available reservoir contents had been processed. Obviously well No. 4 in this example would not be properly located and would of necessity be relatively short lived.

A knowledge of the geology of the producing horizon may be of utmost importance to minimize the isolation and loss from circulation of portions of the reservoir gas. Such knowledge will necessarily be limited in proportion to the number of wells drilled, but all available information should be utilized to the fullest extent.

Competitive recycling operations in the same horizon must be carefully planned in order that maximum benefits may accrue to all operators. The recycled residue gases do not "mix" and so dilute the remaining rich gas, but rather they move and displace en masse the original reservoir material in proportion and toward the zones in which pressure gradients exist. For example, competitive operations where the gas movement is in opposing directions will prove mutually disadvantageous.

It has been pointed out that distillate bearing gases precipitate a liquid condensate when either or both the reservoir temperature and pressure are lowered from their original conditions. It is natural then that the first method of processing involved simple expansion of the well head product into a low-pressure separator and disposition of the gas, in most cases, by venting to the air, and in no cases by return to the reservoir from which it came. This method of production has been largely eliminated by conservation orders, for it precludes economic return of the denuded gas to the formation. In addition, this method as a rule implies a short-sighted production policy, for retrograde pressure condensation within the reservoir may cause irretrievable loss of approximately 50 per cent of the original condensable reserves.

It was early known that normal condensation brought about by temperature reduction would be an important factor in high-pressure distillate recovery, in fact experiments as early as 1935 indicated the curve characteristics such as shown in Figure 2. The practical limit of application of temperature condensation may not be the same for two distillates, the limit being established in part by the sharp break in the recovery curve, such as is indicated in Figure 3. This break indicates, for any constant temperature at which the

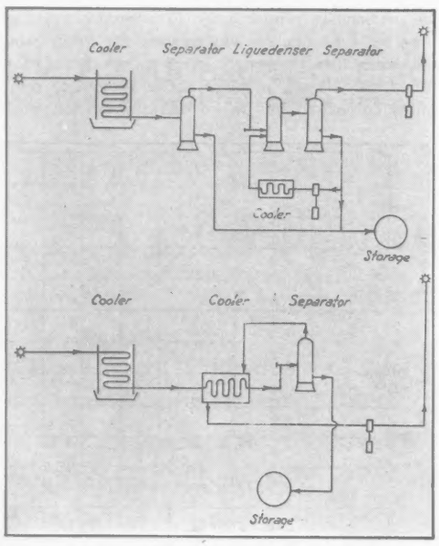
tests are run, the point at which the opposing force of retrograde pressure vaporization becomes the major controlling influence in condensation.

Maximum distillate recovery by retrograde pressure condensation alone would, of course, be made at the base of the retrograde pressure condensation range (approximately 700-800 pounds). On the other hand it is not possible to make commercial recovery solely by retrograde condensation, because the operation of pressure reduction results in a corresponding temperature reduction, and the forces at work to cause liquefaction are both retrograde pressure and normal temperature condensation. As the pressure is reduced below the base of the retrograde pressure condensation range it causes increasing amounts of cooling per pound of pressure drop and the normal condensation caused by temperature reduction is greater than the opposing force of vaporization by pressure drop below the retrograde range. This explains the reason why, by expansion through a choke, maximum separator recoveries are made at pressures of approximately 400 to 500 pounds. Since it is not economic to reduce pressure to the point where this maximum recovery may be had, or even to the base of the retrograde pressure condensation range, only part of the retrograde condensation forces are utilized and, as compensation, temperature condensation is proportionally increased by artificial cooling. One process employing this principle operates at pressures of 1,200 to 1,400 pounds and temperatures of approximately 40° F. The heavier the distillate being processed the higher the pressure at which this process is able to operate, the pressures cited being employed to effect recovery of material that is substantially motor fuel. A process of this type is properly called a condensation process, and is distinguished from the well known absorption process which employs, at the higher pressures, a special type of absorption oil.

Condensation Process

Two very generalized process methods which make distillate recovery by condensation methods are shown in Figures 4*A* and 4*B*. One possible application of the process indicated in Figure 4*A* gathers the gas from the output wells at a plant header, cools the gas by means of heat exchange with cooling water and separates the resultant liquids from the gas. This step in the process makes possible the recovery as a liquid of up to 90 per cent of the total fresh water vapor that is naturally present in all distillate bearing gases. Water vapor, being very susceptible to temperature condensation alone, may be removed to a large extent by separation even at well head conditions of temperature and pressure. Upwards of 50 per cent of the recoverable hydrocarbon liquid will be condensed and separated in this preliminary step, which for obvious reasons is carried out at a temperature in excess of that at which hydrates will form in the flow stream. Following this preliminary cooling and separation, the gas is passed through a choke into a "liquedenser," where it is contacted with a cold stream of previously recovered condensate. Construction of the "liquedenser" is such that this cold condensate reflux suddenly cools the full flow stream, agglomerates and makes ready for separation all of the liquids, and removes the water vapor in the form of hydrates. Liquid recovery is made in a second separator from whence part of the liquid is recirculated through the cooler and into the "liquedenser" and part is withdrawn to storage. Another process of similar general characteristics uses a cold hydroscopic liquid in the circulation system instead of a portion of the cold recovered distillate.

One application of the process indicated in Figure 4*B* gathers the incoming gas at a plant header, flows this gas through water cooled heat exchange coils, then through gas cooled heat exchange coils, and through a choke and into a separator where all the recoverable liquids are separated. The cooled gas from the separator is counter flowed through the heat exchanger to be the cooling medium for the incoming gas and is then discharged to the compressor suction. A system of this type must operate at or above the temperature at which hydrates form, or cause



(Upper) *Fig. 4-A.* (Lower) *Fig. 4-B. Flow sheets of distillate plants*

the process to be cyclic for hydrate thawing. The method of gas heat exchange is, of course, limited as to the minimum attainable temperature; cooling done in this fashion is at the expense of compressor capacity and as such its economic advisability may be readily determined. One plant using this flow scheme is operating at 1,200 pounds and approximately 70° F. to recover distillate with an endpoint of approximately 510° F.

Oil Absorption

The oil absorption plant has not been shown by sketch because with but minor exceptions it resembles the modern intermediate pressure plant. A great deal of experimental work has been done to determine the probable limits of operating pressure of an absorption plant, in that apparently, aside from the economics of the plant itself, operation depends largely upon obtaining a suitable absorption oil. One such plant is not yet in full operation but it has successfuly processed a distillate gas at an operating pressure of approximately 1,200 pounds. Since this form of processing is still somewhat in the experimental stage it can not be properly reported here. It is anticipated, however, that suitable disclosures of this new development will be made during the year.

General Processing Problems

Many problems involving technique and practice have been solved during development work on the condensation processes, a few of which are mentioned here as being of general interest. Controlled stage separation has been effected as a means of fractionation and color control, controlled rate of well flow has been utilized for the same purposes; calculation of the super compressibility of metered gas has been verified by plant scale test; hydrate formation has been studied and methods developed where its objectionable formation has been eliminated; test methods have been developed that provide excellent means of establishing plant control, other test methods have been developed whereby a strange distillate bearing gas may be subjected in the field to plant conditions of recovery and the plant recovery forecast to within 2 per cent.

The importance of compression ratio, or its equivalent, compressor horsepower, can hardly be overemphasized. In some processes the cost of the compressor installation for recycling the residue gas exceeds the cost of the balance of the plant. Two processes, one operating at 1,000 pounds pressure and the other operating at 1,250 pounds pressure, and both recycling at 1,800 pounds, would seem to the layman to be quite similar. Actually, a compressor in the second process will handle 50 per cent more gas per horsepower than a compressor in the first process. An excellent analysis of cost data on compressors and compressor operation has recently been made available and it is recommended to the attention of the industry in connection with this work.[4]

Reserves

Distillate reserves in place in the reservoir may be readily calculated by present methods. Such reserves, on an acre foot basis, will naturally be much lower than the customary liquid oil reserves of similar reservoirs.[5] The percentage of reserves which may be recoverable will depend in a large measure on the well pattern and to a lesser extent on the reservoir characteristics.

Development Policies

Few leases are of sufficient size and under one fee ownership to make recycling operations possible without unitization or other forms of adjustments not provided in the original lease. Unitization of all leases on a structure, or operating agreements between all parties engaged in recycling projects on the structure will, of course, lead to more efficient and profitable recovery for the field as a whole. Problems such as these in the interest of operating economy should of necessity be solved before commencing operations, because, as might be expected of such a new and radical departure in practice, there is as yet insufficient experience to indicate well established policies of procedure.

Conclusion

Tomorrow's production cost will be higher, because tomorrow's well will be deeper and more expensive. Acre foot reserves in place may be less, for the reservoir material in place may be predominately gaseous. Recycling in such a reservoir may offer the only satisfactory method of operation in that it will probably approximately double the recoverable reserves, and divide by 10 or more the number of wells required for drainage. A substantial foundation has been laid for this fledgling phase of the production industry and with our experimental work behind, the future seems to promise a steady development based upon sound engineering analysis and experience.

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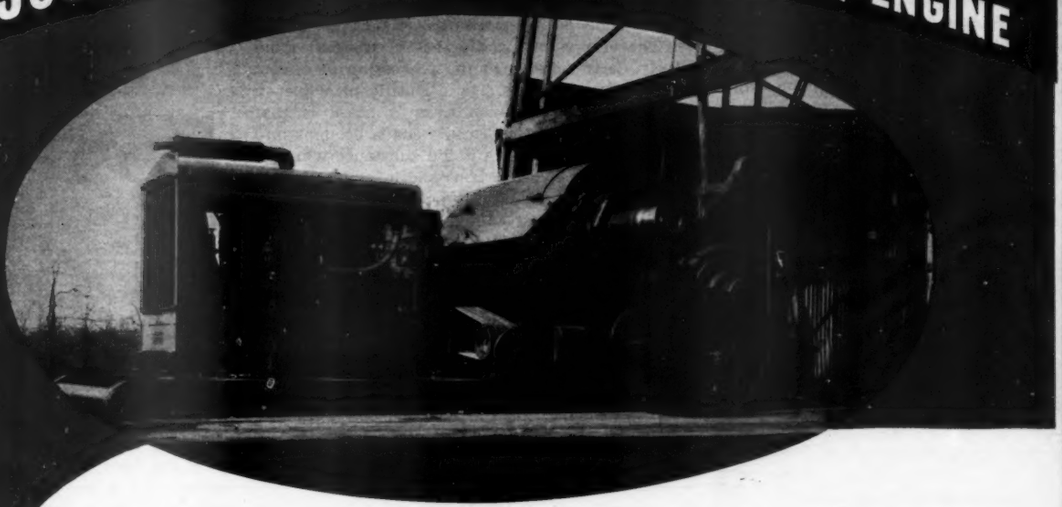

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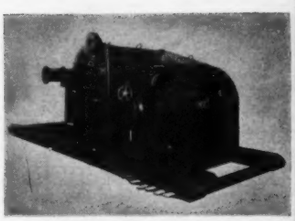

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Recovery of Condensate From Distillate Wells

By EMBY KAYE
Tide Water-Seaboard Oil Companies

The recovery of liquid hydrocarbons from gas is not new. The commercial production of gasoline from this source was begun three decades ago. As is well known, the presence of gasoline in natural gas was discovered after gasoline was accidently produced. Gasoline was found in the low places of a lease fuel line which ran from the casingheads of several oil wells to a boiler. It was "condensate" which was "knocked out" when the cool atmosphere chilled the warm gas coming from the casinghead.

Within the next decade and a half the natural gasoline industry saw its greatest development.

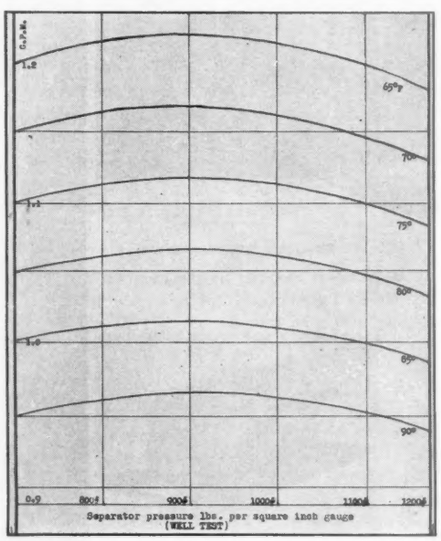

Fig 1—Effect of temperature and pressure upon condensate recovery (first-stage separator)

The crude chilling of gas went through several evolutionary steps, through the compression process, oil absorption and charcoal adsorption processes, direct rectification and variations or combinations of several of these methods. Broadly, the two important methods may be said to be the compression and absorption processes.

In the compression process the gas is first compressed to that point where the partial pressure of the components exceeds the respective vapor pressures; the gas is then cooled to as near the wet bulb temperature as is practicable and at which temperatures substantially all of the desirable hydrocarbons are recovered. This method is generally applicable to so-called rich gas and has been employed particularly where the elevated pressure, frequently up to 300 pounds may be utilized in disposing of the gas to a gas pipe line.

Direct rectification, in which the gas is compressed and the finished product stabilized in one operation, has not been extensively used since it was introduced in 1930. It is, however, gaining favor as its availability for a variety of conditions is becoming known.

The absorption process has been used extensively. It is suitable to the processing of almost any character of gas. The scientific principle on which the absorption process is based is that when a complex hydrocarbon gas is brought into intimate contact with a liquid substance which is soluble in the hydrocarbons and in which the hydrocarbons are soluble, the equilibrium condition results where most of the propane, butane and heavier fractions go into the liquid phase and the methane, ethane and some of the propane and butane remain in the gas phase. The gas and oil are cooled to lower the partial pressure of the hydrocarbon mixture before they are contacted. The hydrocarbons are taken out of the gas with the oil. from which they are later distilled. A definite temperature-pressure oil circulation rate relationship is designed for the character of extraction efficiency desired.

Gas-Distillate Wells—Restriction of Production

The increasing number of so-called gas-distillate fields which have been developed in the past few years has brought a challenge to the industry. It was quite obvious that the several states would not long tolerate the waste of gas in order to permit the production of a few barrels of distillate. In Texas the regulatory authorities have already prohibited the production of gas distillate[1] wells where the producer has no market for his gas in accordance with the conservation laws of the state. The market for gas for legal uses is rather limited, considering the supply and demand, and this fact restricts the output of distillate with the result that the well owner had a "white elephant" on his hands. Where a market was available or where the producer otherwise was "permitted" to produce his wells, the practice generally employed was to drop the pressure at the separator from the well-head pressure to a range of 250 to 500 pounds, or thereabouts, the distillate production representing what happened to drop out in the separator. In some cases that pressure was employed which gave the best results, that is, produced distillate with the lowest gas ratio, while in others that pressure was maintained on the separator which was required to deliver the gas into a service or pipe line. In either case the gas may or may not have been processed for extraction of the remaining gasoline therein.

[1]Single phase in formation.

Not infrequently conservation laws are actually designed to conserve valuable natural resources. But the regulations which prevent the waste of gas as such from a distillate well or pool do more than that. They prevent very largely the waste of distillate in the formation by preventing relatively rapid pressure decline in the formation.

EMBY KAYE

A. P. I.

Paper presented before meeting Southwestern District, Division of Production at San Antonio, Tex., March 16-17, 1939.

Author's title: "Recovery of Condensate From Distillate Wells"

It has been shown that the liquefiable hydrocarbons are in one phase with the gas just above their dew points and that only a slight drop in pressure will result in the condensation of the heavier constituents in the formation, doubtless never to be recovered as Mr. Patten[2] has found and as Mr. Foran[3] has reported. The saturation in the formation is too low to permit the condensed fractions to accumulate in sufficient volume to flow to the well bore. There is hardly more than enough liquid to cover the face of the sand grains. Mr. Patten's classic example of this form of waste within the reservoir is La Blanca field where

[2]Patten and Denny C. Ivey—The Oil Weekly, December 12, 1938; Rig and Reel, March, 1938.
[3]E. V. Foran, "Development and Production Problems in High-Pressure Distillate Pools." Petroleum Technology, Vol. 2, No. 1 (February 1939) A.I.M.E.

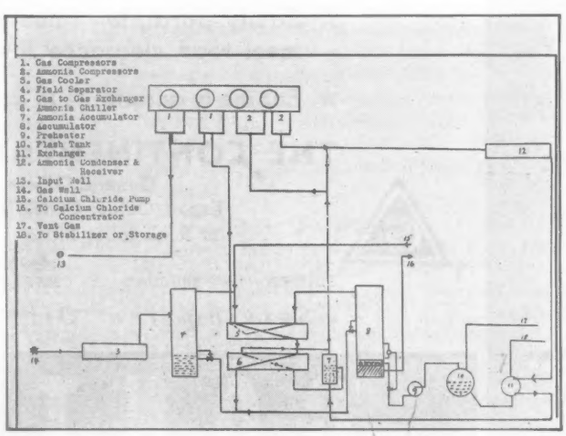

Fig. 2—Flow sheet of Cayuga plant, Tide Water-Seaboard companies

the pressure drop from 3,800 pounds to 2,180 pounds[4] has reduced the recoverable condensate from 9 bbls. to a million cubic feet to 2.6 bbls. Moreover this distillate content is now so low that for practical purposes we might assume that all of the condensate is unrecoverable economically.

The Development of Recovery Processes

Both the forces of conservation and good economics have motivated the petroleum engineer to find or adapt suitable methods of production which would permit the economic recovery of the liquid hydrocarbons in the gas and not do violence to the principles of conservation. The development of what we have come to know as recycling and pressure maintenance plants fills that need. Whatever the detail, the plants are designed to permit the extraction of the liquefiable fractions in the gas at elevated pressure and the return of the gas to the producing formation without waste where the gas can be stored until it is produced for the ordinary purposes to which dry natural gas is put.

Distillate wells, or wells producing gas containing condensable hydrocarbons which in the light of later experience justifies the conclusion that they were distillate wells, were experienced many years ago, however, the infrequency of their occurrence, or the lack of engineering knowledge, or both, perhaps retarded the development of efficient methods for the recovery of the condensate. Much has been said about the phenomenon of retrograde condensation. It lay on the scientific shelf, very vaguely indexed until it was finally applied in the development of a novel and highly useful process for the extraction of condensate from so-called distillate wells. Many distinguished scientists have explained the mechanics of condensation in the retrograde range, but none more simply and adequately than Buckley,[5] little over a fortnight back at the Houston A.P.I. chapter meeting. But the application of the theory to drawing board presented many complications because of the complex mixtures of the gases normally encountered in production.

In the design of absorption and fractionating equipment it is quite essential to have a knowledge of the equilibrium composition relation of the liquid and vapor in a complex hydrocarbon system. Raoult's and Dalton's laws have been used to calculate these relations, but it was early found that the deviations in the calculated values from the actual increased as the pressure increased. These deviations were found in some instances to be up to 200 and 300 per cent, thereby making the results valueless.

Investigators in the field who discovered the behavior of gases from distillate wells found among other things (1) that the recovery of condensate increased as the separator pressure was decreased from well-head pressure, but that (2) presently a point was reached where the volume of condensate decreased, and (3) that with different pools and frequently with different wells in the same pool, the pressure at which maximum condensation occurred varied, and finally (4) they found that by cooling the gas increasing recoveries were obtained. (Figures 1 and 3).[6] It is now well known that this condensation is the result of both normal and retrograde condensation and that the maximum condensation for every mixture of hydrocarbons at a given temperature occur at that pressure at which the normal and retrograde condensation of the various liquefiable fractions in the mixture reach a maximum. This pressure may be as high as 2,400 pounds, although this data is yet to be confirmed. Reducing the temperature at the point of pressure drop has been found to make possible an increase in this pressure without loss of recovery.

Considering the novelty of the art and the engineering problems which had not yet been thoroughly solved, it was natural that small scale experimental units were built in the field and conditions provided under which results were observed as a basis for the design of the commercial plant. Experimental work provided a great deal of design data. However, much remained to be done as the first plant of Tide Water Associated-Seaboard at Cayuga demonstrated the inadequacy at that time of information relating to exchange, cooling, compressibility and other design data, many of which have been developed and made available from observations of the operating plant. This plant has been operated under various conditions of pressure and temperature to develop data as to horsepower, temperatures, yield and the interrelated economics of the whole. This

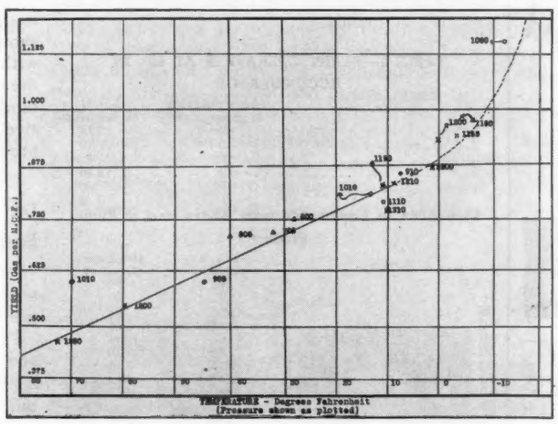

Fig. 3—Miscellaneous tests, plant scale

data has been made available to interested manufacturers of equipment used in recycling processes.

Gas-Hydrates

Experimental operation at low temperatures where a high order of extraction efficiency was obtained indicated that gas-hydrates tended to freeze at anything below normal temperatures (60°70° F.) and that, as pressures were increased, even at higher temperatures. This problem resulted in the use of hydroscopic materials and with their aid temperatures as low as —20° F. were reached in at least one commercial plant. No deleterious results have been experienced in any part of the cycle as a result of this operation.

Factors Affecting Design

Test procedure and equipment have been developed to simulate plant conditions on the basis of which reasonably close predictions of plant performance can be made from a plant design indicated by these tests and by fundamental analysis of the gas, condensate and residue gas.

Except for one plant which is operating at least in part in combination with the absorption process, recycling plants in general operate on the same principles, to-wit: pressure drop into the retrograde condensation range and cooling with or without dehydration to affect normal condensation. The rest is detail.

The extent of cooling is determined by the nature of the components and the economics of extraction. In some cases the market may determine the extent to which the lighter fractions are to be extracted. It is erroneous, however, to assume that only light ends are produced at higher extraction efficiencies. (Tables 1 and 2.) While this depends finally upon the character of the gas processed, generally both light and heavier ends are extracted with a resultant increase in recovery of saveable hydrocarbons. This is particularly desirable where the product is to go directly into motor fuel where the light ends make for volatility and add appreciably to the octane value of the fuel. It is not unduly stressing the necessity for efficient extraction when it is pointed out that operations at Cayuga could not be economically conducted except with relatively complete extraction where temperatures on the order of 0° F. are required. On the other hand, the writer is familiar with at least one plant in the South Texas area where no such temperatures will be required to obtain economically optimum yields.

It is unwise if not equally erroneous to assume with today's uncertain knowledge about the flow of gas in every reservoir that it is not necessary to extract substantially all the saleable fractions in the gas because it can later be recovered. Recycling should be planned both as to the well pattern and the extraction process as though the gas will not be processed more than once. Dilution can make the operation, except in the case of very rich gas, as unprofitable as channeling. It would appear to be good business therefore to plan to do a complete job of extraction the first time the gas is handled.

In several plants with which the writer is more or less familiar, the gas comes to the process area at as near well-head pressure as is possible, is cooled by water exchange to a temperature above the freezing point of gas-hydrates, the water drawn off, the gas cooled by gas exchange and the gas expanded in the separator accumulator. The final gas temperature is on the order of 65° to 75° F. Where a hygroscopic material is used in one plant, temperatures are brought down to the order of 30°-35° F. and by the use of a refrigerating agent the temperatures are brought down to the order of 0° although the operators are experimenting with temperatures down to —20° F.

In several plants developed by one group of engineers it is reported that this general design is supplemented by introducing into the gas stream various quantities of cooled condensate. It is averred that this condensate acts as a densifying and liquefying agent, by increasing the liquid mass. It is claimed for this process that subnormal temperatures are not required to bring about efficient liquid recovery. Doubtless plant balances will be made available presently to demonstrate the efficacy of the process.

The writer can say even less about the efficiency of the absorption process in the field of pressure used in recycling plants. In the only extant plant the field gas is reduced at the absorbers from approximately 2,000 pounds to 1,200 pounds, and the absorption operation described earlier in this paper conducted at that pressure. The rich oil travels under its own pressure into a conventional low-pressure distillation unit, and the denuded oil is fed to the suction of a high-pressure discharge pump. Quite apart from the element of cost, the efficiency of the process at the prevailing pressure and its utility at higher pressures remains to be demonstrated. The industry will watch with interest the further development of the absorption process at elevated pressures.

Figure 2 represents a plant described in detail by Vaughan[7], where the wet gas is cooled by water exchange to 72° F.[8], by gas exchange with lean

[4]Patten and Ivey report that the original formation pressure was 4,200 pounds and that the distillate production was 18 bbls. to the million.

[5]Humble Oil & Refining Co., A.P.I., Houston, February 28, 1939.

[6]Figure 3 represents plant tests at Cayuga. End products not uniform except as to gauge pressure.

[7]A.P.I. Houston, February 28, 1939.

[8]A typical day's conditions.

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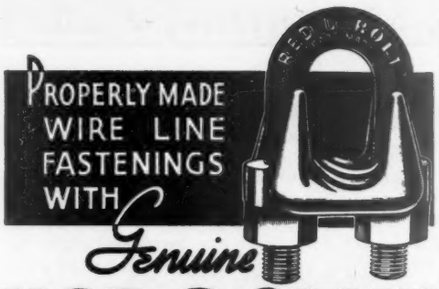

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gas to 20° F. and to —4° F. in the ammonia chiller. Water is drawn off in the field separator. The gas is carried at as near well-head pressure (1,470 pounds) as possible and is reduced to approximately 1,200 pounds in the extraction separator or accumulator where a temperature of —5 to +15 is maintained. Condensate produced in the field separator, if any is carried to the flash tank via the gas stream from the final cooler, or directly. The lean gas at a temperature of —20 to +15, depending upon the operating conditions, is exchanged with the wet gas and passes to the compressor at from 46 to 70° F., and compressed to 1,750 pounds[9] to be returned to the formation. The lean gas may go direct to the compressors.

From the accumulator the condensate is preheated and flashed to 250 pounds at 0° F. Vapors from this operation show by charcoal test a content of .025 G.P.M. which is, of course, exceedingly low. The product then goes to stabilizer or to a low pressure separator.

In a plant where the character of the gas did not require temperatures made possible by a refrigerant of the order of ammonia or propane, the flash tank would be operated at a lower pressure and act simply as a surge tank for the stabilizer. Where ammonia is used, the cold condensate is used to cool the liquid ammonia on its way to the stabilizer.

TABLE 1—PLANT OPERATION AT 60° IN ACCUMULATOR

Test No.	Accumulator temperature	G.P.M. in residue
1	60° F.	.4773
2	60	.4838
3	60	.4346
4	58	.4846
5	59	.4596

Distillation of Condensate from Above and of Plant Product

	Plant product	Residue product
I.B.P.	75°	66°
10%	102	69
20	124	76
30	146	84
40	166	94
50	188	106
60	212.	121
70	240	142
80	280	174
90		
E.P.	397	244
Rec.	89.5%	88.0%
Res.	1.5%	1.0%
V.P.	14.4 lbs.	.....
Gr.	78.9	94

TABLE 2—PLANT RECOVERY

Accumulator temperature	G.P.M. recovered
78°	.46
60	.54
22	.75
0	.92

Vaughan reported that in that plant substantially the same horsepower as required to handle a given volume of gas from 1,200 pounds to 1,750 pounds at 74° F. as for gas of 8° to 10° F., the horsepower used in refrigeration being compensated for by the cooler gas handled. He represented that the additional cooling was reflected by a 41 per cent increase in yield, the end product being stage weathered to the same gauge pressure. The cost of refrigeration equipment apart from the compressor in this instance would be fully amortized in about six months. Stage weathering being what it is, no accurate information was available to evaluate the finished product in either case in terms of propane or isobutane. A stabilizer just completed in this plant will permit plant balances to be taken and the results made available.

At the high operating pressures employed in recycling more or less dissolved gas is accumulated in the separator. Kimmell and Huntington[10] have shown the results of multistage separation and more recently Huntington[11] reported the higher ultimate recoveries made possible by stage separation to 0 pounds or to 30 pounds gauge. It is apparent, however, that except in those instances where a very heavy product is recovered, conventional stabilization is required to produce the desired end product and to produce it without waste.

[9]1,650-1,750, depending upon the lean gas temperature.
[10]The Oil Weekly, October 17, 1938.
[11]The Oil Weekly, February 13, 1939.

Conclusion

Whatever method is used to extract condensables from gas-distillate wells, certain conclusions may be drawn from an understanding of the principles discussed herein, and elsewhere by others:

1. The recoverable hydrocarbon content should be sufficiently high. This has been estimated at approximately 18 bbls. to the million cubic feet.

2. Sufficient acreage should be available to justify the investment, which should not be over $20 per gallon condensate capacity, including the cost of the wells.

3. Consideration should be given to the proper drilling and location of output and input wells.

4. A prospect should be field tested, and in the light of the results, the process designed should economically extract substantially all of the condensables found in the gas which have a commercial value.

5. The method used should permit of operation at the highest possible pressure in order to keep at a minimum the cost of compression to return the denuded gas to the reservoir.

6. All the gas should be returned to the formation; where sales are absolutely necessary, they should be held to a minimum. Loss of distillate within the reservoir is the result of the extensiveness of the pressure drop, not of the rate. Every diminution results in the condensation of progressively lighter fractions, and their loss to ultimate production.

Dr. Walter Friedmann Outlines Early Work in Isomerization

Dr. Walter Friedmann, Mexico City, has written the following regarding early work done in isomerization:

The research work of Petrov, Meschcheryakow and Andreev (The Oil and Gas Journal, February 2, 1939, pp. 42-45) entitled "Isomerization of Heptane, Octane and Alpha-Hexene," explains the *catalytic* isomerization using aluminium chloride, zinc chloride and malybdenum trisulfide.

In the "abstract" of this paper *preliminary research work* is reviewed: "isomerization" by acyclic hydrocarbons under normal and elevated pressures was established by the work of Morris and Reuter, H. Hugel and A. Izayna, G. Hugel and M. Kohn, Stratford, A. D. Petrov, Petrov and Ivanov.

All the papers mentioned appeared in the literature between 1927 and 1932. But in 1916 I published my *first contribution on the isomerization of n-octane* to isooctane in a paper "Ueber die Einwirkung von Schwefel auf Octan untu Druck" (Ber. Che. Ges. 49, pp. 1346-1347). In the experimental part the changes of the boiling point and of the specific gravity of an *n*-octane after being heated in sealed tubes for 24 hours at 270° to 280° C. was noted and explained by isomerization of *n*-octane to isooctane under the experimental conditions.

"As explanation of this change in structure of a normal hydrocarbon to a hydrocarbon of branched constitution, the opinion of a migration of hydrogen from one carbon atom to his neighbor was advanced—a similar migration as is supposed to happen during the pyrolysis of the higher aliphatic hydrocarbons.

Also in another paper (Walter Friedmann, Brennstaff Chemic, BD8, 1927, p. 257) the results of above experiments were mentioned speaking clearly of the isomerization of *n*-octane to isooctane.

At last, in The Oil and Gas Journal, December 18, 1930, p. 106, I discussed the isomerization of *n*-octane as follows: "The change in boiling point and density observed where *n*-octane was heated under pressure gives support to the assumption that *n*-octane is isomerized to a branched octane.

Oil Development and Production Practices in SOUTHWEST TEXAS

By
C. H. Row and
R. H. McLemore
Sun Oil Co.

This paper, prepared to review geological relationships to oil development, deals with that portion of our state known as the San Antonio or Southwest Texas district, which is defined in this paper as follows:

Bounded on the north and northeast by the counties of Edwards, Blanco, Milam, Burleson, Colorado and Calhoun; Rio Grande and the Gulf of Mexico bound the area on the west, south and southeast. San Antonio is in the approximate center of the large end of this triangular province. See Figure 1. (Map on Page 94.)

In this paper are discussed the general geology of this area, its regional structure, the specific types of oil traps, the discovery of oil and progress of its development, production data with relation to the geologic section, some general estimates and predictions, and production practices common to the district.

General Geological Discussion

The geologic section of the area is made up of a number of formations of lime, sand, shale and their variations with a regional gentle dip toward the Gulf of Mexico. At their exposed up-dip edges these horizons are recognized by the vegetation they support, the type of topography and character of the soil produced on weathering of the rocks. In general the formations outcropping farthest from the Gulf are composed of harder rocks, while the younger formations near the coast are poorly consolidated and therefore much more easily penetrated by the drill. This section includes the Glen Rose formation of Lower Cretaceous age, at its base, and the present day beach deposits at its top—a total thickness of 25,000 to 30,000 feet of sediments.

During and since the deposition of the formation of this section the forces which are continuously active in altering the earth's crust have developed faults, folds, domes and unconformable relationships between various parts of the section. It has been found that certain types of these features form favorable traps for the accumulation of oil.

In the so-called fault zone of Southwest Texas, as the name suggests, there has been a great amount of faulting, the displacements varying from zero to several hundreds of feet. In some cases, where the upthrow is on the southeast or downdip side and where local flexure of the beds or local change in the direction of the fault has completed the closure, an oil horizon has been sealed effectively and a trap formed for the accumulation of oil. Good examples are the Luling and Darst Creek fields of Caldwell and Guadalupe counties. Variations include the Pettus district fields of Bee County, the Fitzsimmons field of Duval County and others.

In the coastal belt of the district the common type of structure is the anticline or elongated dome, sometimes complicated by faulting. This type is well represented by the Saxet and Luby fields in Nueces County, the Greta and Refugio fields of Refugio County, and others along that general trend.

Through western Starr County, Zapata, Webb, Duval and McMullen counties a number of fields have resulted from the updip pinching out of sand bodies and associated nosing of the structure

A. P. I.

CHARLES H. ROW

R. H. McLEMORE

Paper presented before meeting Southwestern District, Division of Production at San Antonio, Tex., March 16-17, 1939.

or minor faulting or both. Several areas of very satisfactory production have been found, and notable examples are the Ezzell field of McMullen County, the Government Wells group of fields of Duval County, Lopez and the Mirando City group in Webb County, the Escobas and Comitas fields of Zapata County, and the Guerra, or Cuevitas, field in Starr County. This type of oil trap is somewhat peculiar, at least so far as Southwest Texas is concerned, in that it is confined rather definitely to the above mentioned five counties.

There are within the area covered by this discussion a few definitely known salt domes, of which Palangana and Piedras Pintas domes in central Duval County are examples. Both of these domes have produced small quantities of oil. Although salt has been found in these two domes only, their alignment with the salt domes of Mexico and the great salt dome belt of the southeast Gulf Coast of Texas suggests the possibility that some of the producing fields of the Southwest Texas coastal belt may overlie deep seated masses of salt. However, 9,000-foot wells in the Refugio field and a 13,728-foot well on top of Agua Dulce structure did not encounter salt dome materials.

According to C. A. Warner* of Houston, small quantities of oil were found in shallow wells over Piedras Pintas dome, Duval County, as early as before the Civil War. It was used as fuel in camp torches and for lubricating the wheels of wagons and carts. About the same time small quantities of oil were secured on the plantation of Judge Minor, near Lavernia, in Wilson County. In 1886 oil was encountered by George Dulnig while drilling for water on his land just south of San Antonio. From this property is obtained the first record of commercial oil production in Southwest Texas, this being in 1889 when sales of 48 bbls. were reported.

With these occurrences as clues to possibilities, and the Spindletop discovery in 1901 as a further incentive the drilling of shallow wells began in earnest search for oil. There was small commercial production at Piedras Pintas in 1905 and spreading of the shallow well development in the Mission field area of Bexar County at the same time. About 1913 the Somerset field of Bexar and Atascosa counties was discovered. A few years later the Mirando Valley field of Zapata County was found and that discovery resulted in trend drilling which led to several more similar and larger fields being discovered. Since that time there has been a gradual increase in the average depth to which wells have been drilled each year in search for oil and the annual production for the district has mounted to a total of 82,750,000 bbls., under proration, for 1938.

Figure 2 shows trend of annual production for the past 21-year period. This graph indicates the results of concentrated drilling campaigns, the curtailment of activities during the depression and voluntary reduction of runs during low prices of oil. Despite the enforcement of proration in 1934, production increased rapidly for the next three years because of extended activities in the coastal belt and the discoveries there of many new fields in the Oligocene sands. The peak of production was in 1937 when 84,300,000 bbls. were produced; the slight drop of 1,550,000 bbls. in 1938 is explained by adjustments in proration, because the discovery record for 1938 is a favorable one.

During the year 1938 in Southwest Texas 557 wildcat wells were drilled with a total footage of 1,771,401, an average depth of 3,108 feet. The completion of 33 of these wildcats resulted in discoveries of new oil fields and 16 of them, in discoveries of gas fields. The total of 49 new discoveries for the district in 1938 represents 8.8 per cent of the total number of wildcat wells drilled. In addition to these results the drilling of wells in and near producing fields led to the discoveries of 55 new sand horizons and the extensions of a num-

*Written communication February 6, 1939.

ber of producing areas. Jackson County has a unique discovery record for 1938, for a total of 10 wildcat wells drilled during the year four resulted in new discoveries.

PRODUCTION DATA

The accompanying Table 1 shows a type geologic section which includes the formations involved in this study. Tables 2 and 3 show the oil and gas fields of Southwest Texas listed with their respective producing horizons.

Miocene Production

The youngest production of commercial value in Southwest Texas is from the Miocene section. The sands of this age are usually somewhat lenticular and the production erratic. The major portion of the oil from this horizon is produced in the Saxet district of Nueces County. The total production, to date from this geologic section is about 8,000,000 bbls.

Upper and Middle Oligocene Production

The sands of upper and middle Oligocene age have been important oil producing horizons in the coastal part of Southwest Texas for several years. Fields contributing large amounts of oil from this section are Flour Bluff, Greta, McCampbell, Placedo, and the Saxet district. To date the cumulative production from the upper and middle Oligocene zone is approximately 63,000,000 bbls.

Frio-Vicksburg Production

The most prolific oil-bearing zone in the coastal group of Southwest Texas fields to date is the Frio-Vicksburg series of sands. Several hundreds of feet of sand are involved and the lensing characteristics of the beds when found on an uplift offer unusual possibilities. Among the older fields producing from this zone are Heyser, McCampbell, Plymouth, Refugio, Samfordyce, Saxet, and Tomoconnor. Exploration of this zone during the past 1½ years has resulted in the following rather important discoveries: Alice, Francitas, Kelsey, La Rosa, East Premont, Sun and La Gloria. A total of 47 fields are now producing from one or more sands in this geologic section, and their cumulative production to date is approximately 97,000,000 bbls.

Jackson Production

The Jackson section, comprising the Cole, Government Wells and Mirando sand horizons, has contributed 125,000,000 bbls. of oil to the total for Southwest Texas. Fifty-three fields have produced from the Jackson—the largest contributors being Government Wells, Loma Novia, Seven Sisters, Mirando City, Escobas and Lopez. Of the several oil-bearing zones discussed in this paper the Jackson sands are second in amount of oil produced to date. The beds, where producing, are reasonably shallow and the lower drilling costs have encouraged their prospecting. In Duval County alone 65 wildcat wells were drilled during 1938.

Cockfield-Yegua Production

The Cockfield-Yegua sands, next older than the Jackson zone, have produced a total of 37,000,000 bbls. of oil from such fields as Dirks, Pettus, and North Pettus. Among the more recently developed areas in this horizon are the Fitzsimmons field and the vast portion of North Sweden field, both in Duval County. Most of the oil yielded by this zone is from its upper part or the "Pettus" sand.

Mount Selman Production

Thus far the Mount Selman production in Southwest Texas is unimportant. The total to date of around 250,000 bbls. is mainly from Carolina-Texas field of Webb County and Roma field of western Starr County. In southern Zapata County the Queen City member of the Mount Selman formation yields gas on a large structure and shows of oil with the gas have been reported, but no commercial oil production has been developed to date.

Navarro-Taylor Production

The sands and sandy shales of the Navarro-Taylor formations are the horizons from which the first commercial production in Southwest Texas was recovered. They were first prospected

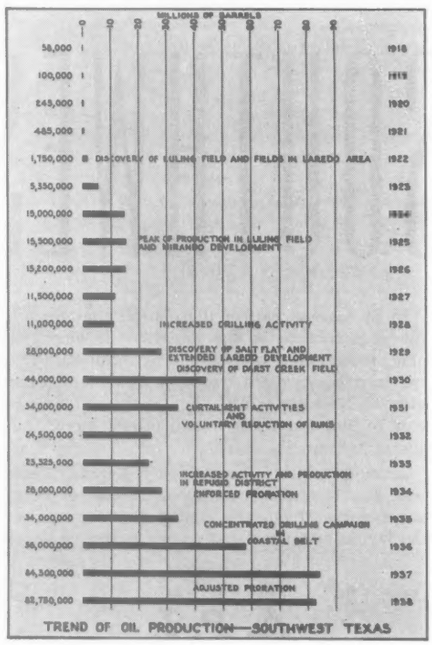

Figure 2

in Bexar County and are unique in that thin sand beds distributed throughout hundreds of feet of shale sections have been found saturated with oil, and operators have set in individual wells several hundreds of feet of perforated pipe in order to recover the seepage from the sand laminations. Small initial productions are the rule, but the low-drilling costs and long life of the fields have made this a very popular horizon for prospecting by the smaller operators. The Somerset field of Bexar and Atascosa counties and the Minerva-Rockdale field of Milam County have contributed most of the 17,000,000 bbls. of oil recovered from the Navarro-Taylor section to date.

Serpentine Production

Serpentine, an altered product from igneous intrusions along the fault zone of Southwest Texas, has been found productive of oil where porosity and structural conditions are favorable. This material usually is found replacing portions of the Taylor and Austin chalk formations. Because of the variable porosity some small localities have yielded prolific quantities of oil while others, even on favorable type of structures, have been barren or nearly so. Thus far the most favorable development of the serpentine and associated plugs has been found in Caldwell, Bastrop and Williamson counties. Lytton Springs, Dale Hilbig, Yoast, Chapman, Thrall and Byersville fields have yielded the major portion of the 20,000,000 bbls. of oil from serpentine.

Austin Chalk Production

The Austin chalk formation, though not known generally to contain porous horizons, shows oil or gas over rather a wide belt of country through the fault district. It has been prospected mainly along some of the known faults or fractured zones and in some cases where the saturated portion of the chalk has been broken up to form a natural reservoir initial production has been large. One or two exceptionally large wells were reported from the Austin chalk in the old Alta Vista field, 7 miles south of San Antonio. The use of acid in increasing the reservoir space in the Austin chalk has been employed successfully in the last few years. The production of oil from this formation has been reported along with that from other formations in some cases, so that the actual amount recovered from the Austin chalk is not known. The authors venture an estimate of less than 10,000,000 bbls. total to date. The fields contributing most of this are Branyon, Buchanan, Dunlap, Salt Flat, Darst Creek, Darst Creek Extension and Pearsall.

Buda Lime Production

Production from the Buda limestone is unimportant, probably not exceeding a total of 125,000 bbls. to date. As in the case of the Austin chalk the accumulation is associated with fractured or faulted beds and probably is the result of migration of oil along the fault line zone from some other horizon higher or lower in the geologic section. Pearsall and Branyon are the only fields in which commercial quantities of oil have been recovered from the Buda limestone.

Edwards Limestone Production

The upper dolomitic phase of the Edwards limestone has yielded more oil to date than any oil-bearing zone in Southwest Texas—a total of more than 151,000,000 bbls. The bulk of this has been from Luling, Salt Flat and Darst Creek fields, which are still producing between 6,000,000 and 7,000,000 bbls. a year. A yield per acre of 35,000 to 50,000 bbls. for leases well located on structure is attributed to a section of 35 to 50 feet of saturated porous lime and a natural flushing of the reservoir by sulfur water.

The following table summarizes the approximate cumulative production figures to date from the oil-bearing horizons of Southwest Texas:

	Barrels
Miocene	8,000,000
Upper and Middle Oligocene	63,000,000
Frio-Vicksburg	97,000,000
Jackson	125,000,000
Cockfield-Yegua	37,000,000
Mount Selman	250,000
Navarro-Taylor	17,000,000
Serpentine	20,000,000
Austin chalk	10,000,000
Buda lime	125,000
Edwards lime	151,000,000
Total	528,375,000

Potentialities of Area

These various oil-bearing horizons offer future possibilities outside the fields in which they are now producing. The Miocene sands, though they have contributed only a small part of the oil from Southwest Texas, must be considered potential reservoirs in the near-coast fields. These beds have a favorable producing record over the deep-seated salt domes of Southeast Texas and are known to be present generally over structures in the coastal area of Southwest Texas.

The yield from the upper and middle Oliogocene section has been increasing annually and the discovery of each new coastal structure adds to the potentialities of this group of sands. Such discoveries as West Ranch and West Saxet during 1938 have built up the reserves in this section and knowledge of sand conditions and production history in such fields as Flour Bluff and Greta will encourage wildcatting for similar results.

The potentialities in the lower Frio and Vicksburg sands have been demonstrated during 1938 by a number of important discoveries and this zone will be a goal of many wildcat drilling projects during the next several years. If the discovery rate of the past year can be used as a guide we may except substantial new reserves to be found as a result of this activity.

Low drilling costs in the Laredo district insure

continued active prospecting for Jackson production. History of the area to date and improved technique in finding the stratigraphic oil traps indicate for the future its share of new discoveries.

Reasonable continued exploration for oil in horizons already recognized as substantial oil-bearing zones is to be expected. In the case of nearly every one of the oil horizons herein discussed there remains opportunity for trend development as well as downdip development in hopes of finding beds carrying oil at deeper levels.

As to possibilities in formations not now producing in Southwest Texas may be mentioned the Wilcox-Carrizo sand zone and the Glen Rose lime. This area already is experiencing new leasing activity along trend southwestward from the recently developed Wilcox production in Southeast Texas. During 1938 an 8,300-foot test to the Wilcox in central Goliad County encountered a well developed sand carrying salt water in that formation. Several other similar tests are in prospect at this writing (February, 1939). The Glen Rose formation, with oil and gas production in East Texas and Louisiana, gas with some distillate in Maverick County, Texas, and small quantities of oil in McClennan County offers possibilities along the trend in Southwest Texas. It is being explored further in Maverick County, but will not be a very popular objective until one good area of commercial production is found within it.

No attempt is made here to estimate the oil reserves in Southwest Texas. However, a general statement as to the amount of oil likely to be produced from the present proven areas may be in order. The authors have made a careful study of factors affecting reserves in all the producing fields and venture the opinion that certainly there will be produced as much more oil as already has been taken out—that is more than a half billion barrels. A more liberal interpretation of proven acreage and the inclusion of deeper sand possibilities in the known producing areas would increase this estimate to between three quarters of a billion and a billion barrels as yet remaining to be produced within the known fields.

Production Practices

For purposes of treating the drilling and production practices in Southwest Texas the area is divided into three zones, each of which has problems peculiar to that locality. Zone No. 1 includes the section along the Gulf Coast, extending from Victoria County southwest to Kleberg County. Zone No. 2 embraces the territory roughly parallel to the coast line, approximately 150 miles inland, extending from Goliad County in a southwesterly direction to Zapata County. Zone No. 3 contains the immediate vicinity of San Antonio; Bexar, Guadalupe, and Caldwell counties.

ZONE NO. 1

The coastal area of Zone No. 1 has been the scene of the greatest activity for the past few years, and is presenting more interesting problems to the oil driller and producer than either of the other zones.

Terrain and Road Conditions

The terrain is low and flat, dipping slightly toward the coast. The soil is a black gumbo, which becomes almost impassable during unfavorable weather conditions. A fine network of state and county paved highways facilitates equipment movement between fields, but provision usually must be made for material movement within the fields. Shell and caliche roads are often built, meeting the state and county highways. Ordinarily these are made 14 feet wide, with a 6-inch surface of shell or caliche for the main roads, and can be built at a cost of $100 per 100 feet. The lateral roads are usually 10 feet wide with a 4-inch surface of shell or caliche, and can be built at a cost of $60 per 100 feet.

TABLE 1—GEOLOGIC TABLE FOR SOUTHWEST TEXAS

Age—	Group	Formation
Pleistocene	Houston	Beaumont Lissie
Pliocene	Citronelle	Goliad
Pliocene and Miocene	Fleming	Lagarto Oakville
Oligocene	Upper	Catahoula
	Middle	Discorbis Heterostegina Marginulina
	Lower	Frio Vicksburg
Eocene	Jackson	Whitsett McElroy (T. Hockleyensis) Caddell (T. Dibollensis)
	Claiborne	Cockfield-Yegua (Undivided) Cook Mountain (Undivided) Mt. Selman (Undivided) Carrizo
	Wilcox	Undivided
	Midway	Undivided
Cretaceous	Upper	Navarro Taylor Austin Eagle Ford
	Lower	Buda Del Rio Georgetown Edwards Comanche Peak Glen Rose Travis Peak

Drilling Practices

All wells are drilled with rotary rigs. The present producing zones vary from a depth of 3,500 feet to 9,000 feet. Since there is a ready supply of gas and boiler water in most of the fields, steam rigs are used almost exclusively. The usual rig is large enough for drilling to a depth of 9,000 feet, or deeper, and consists of a 122-foot or 129-foot derrick, three 125-hp., 300-pound boilers, two 18-inch or 20-inch pumps, 12-inch by 12-inch engine, and hoisting equipment capable of handling long strings of drill pipe with speed and safety.

The water supply available from creeks and rivers and from shallow sands is usually suitable for boiler purposes. In general the water is high in compounds of sodium, which will cause foaming, but low in compounds that cause corrosion, or incrustation. The corrosive or scale-forming action is a small matter, and expense for boiler chemicals is low.

The formations penetrated from the beginning of the drilling produce a good wall-building mud, weighing from 9.5 to 9.8 pounds per gallon. Weighting material is added in sufficient quantity to build up a mud that will be safe in each particular field. Most operators attempt to keep a drilling mud weighing approximately 10 pounds per gallon having a Marsh-funnel viscosity of 40 seconds. Shale shakers, which are widely used, have proved of value in both the reclamation of drilling fluid and the disposal of the undesirable solid content of the mud.

The coastal area is dotted with craters resulting from wells that have blown out. The unconsolidated sand sections which are found at depths ranging to 1,500 feet require that long strings of surface casing be set. Operators realize that blowouts in this area will charge the shallow sands with high-pressure gas and make further drilling operations in the field extremely hazardous. They recognize the necessity of having all the upper sands cased off, and the usual practice is to set from 500 to 1,500 feet of surface casing, depending upon the sands encountered, using sufficient cement to fill the entire area between the formation and the pipe. Ten and three-fourths inch pipe is set in approximately 15-inch hole. The use of welded surface casing, bell and spigot type, is popular in this area. Surface casing is allowed to set from 24 to 72 hours, depending upon the preference of the operator, before it is tested for a complete shut-off and the plug drilled. Nearly all the formations encountered can be successfully drilled with fishtail bits. In the drilling of a 10-inch hole the average rate is 25 feet per hour, and the average footage per bit is 900 feet. When sand conditions are well known, the conventional core barrel is used, but the use of the

TABLE 2—OIL-PRODUCING FORMATIONS—FAULT ZONE OF SOUTHWEST TEXAS

Field and county—	Navarro-Taylor	Serpentine	Austin chalk	Buda lime	Edwards lime	Remarks
Alta Vista, Bexar	X	..	X	..	..	
Batesville, Zavala	..	..	..	..	X?	Crevice
Branyon, Caldwell	..	..	X	X	X	Numerous crevice wells
Buchanan, Caldwell	..	X	X	..	..	
Burdette Wells, Caldwell	..	..	..	..	X	
Byersville, Williamson	..	X	..	..	..	
Carroll, Bastrop	X	X	..	..	..	
Cedar Creek, Bastrop	..	X	..	..	..	
Chacon Lake, Medina	X	..	..	..	..	
Chapman, Williamson	..	X	..	..	..	
Chittim, Maverick	..	..	..	..	..	Gas in Glen Rose
Chreisman, Burleson	..	..	..	..	X	
Cooksey, Bexar	X	..	..	..	..	Abandoned
Dale, Caldwell	X	X	X	..	..	
Dale—North, Bastrop	X	X	..	..	..	
Dale—West, Caldwell	..	X	..	..	..	
Darst Creek, Guadalupe	..	..	X	..	X	Some crevice wells
Darst Creek extension, Guadalupe	..	..	X	..	..	Some crevice wells
Dunlap, Guadalupe	..	..	X	..	..	Some crevice wells
Dunlay, Medina	..	X	..	..	..	
Eckert, Bexar	X	..	..	..	..	
Gas Ridge, Bexar	GX	..	..	..	..	
Hilbig, Bastrop	..	..	X	..	..	
Ina, Medina	X	..	..	..	..	
La Coste, Bexar	X	..	..	..	..	
Larremore, Caldwell	..	..	..	..	X	
Lone Oak, Bexar	X	..	..	..	..	Abandoned
Luling, Caldwell	..	..	X	..	X	
Lytton Springs, Caldwell	..	X	..	..	..	
Manda, Travis	..	X	..	..	..	Abandoned
Manford, Guadalupe	..	..	X	..	..	Crevice production
Minerva-Rockdale, Milan	X	..	..	..	..	
Mission, Bexar	X	..	..	..	..	
Ottine, Gonzales	..	..	X	..	..	Abandoned
Pearsall, Frio	X	..	X	X	..	
Riddle, Bastrop	X	..	..	..	..	
Sal Mar, Guadalupe	..	..	X	..	..	
Salt Flat, Caldwell	..	..	X	..	X	
Somerset, Atascosa and Bexar	X	..	..	..	..	
Southton, Bexar	X	..	..	..	..	
Staples, Guadalupe	..	..	X	..	..	
Taylor, Medina	X	..	..	..	..	
Thrall, Williamson	..	X	..	..	..	
Von Ormy, Bexar	X	..	..	..	..	
Walnut Creek, Caldwell	..	X	..	..	..	
Voast, Bastrop	..	X	..	..	..	
Zoborowski, Guadalupe	G	..	X	..	..	

Note: X = Oil production. G = Gas production. S = Show of oil or gas.

wire line core barrel is prevalent in the drilling of wildcats and wells in areas where it is desired that long sections of formations be cored. The usual practice is to set 7-inch casing and to allow the cement to harden for 72 hours before testing the casing and completing the well.

Completion Practices

The producing horizons of this zone are composed largely of loose unconsolidated sands, and have always presented an acute production problem because of the tendency of the sand to come into the bore of the well. This sand, if produced with the oil, results in severe abrasive action on the well connections; and, if not produced, will pack tightly opposite the producing zone, often resulting in complete stoppage. For a number of years all wells in this area were completed by setting small gauge, wire-wrapped screen opposite the sand section and packing it off in the casing. This screen would permit the production of the smaller sand grains and hold back the larger grains, causing a coarse sand to gather between the screen and hole, which would act as an additional filter.

Wire-wrapped screen is still set in many wells, both in the open hole and inside the casing, when the casing has been set on bottom and perforated. However, successful completions are now being made by setting casing on bottom, perforating, and producing without any screen or liner in the well. The sand hazard is not so great under the restricted production practices, and many operators believe it to be more advantageous as well as more economical to produce their wells without screens. In the event of a well's sanding up, the cleaning-out process is much simplier if the well is producing through perforations, than if a screen and packer are set, as it is often necessary to cut out the screen. Whether it will be necessary to produce through screens in the later life of these wells remains to be seen.

Since many of the fields have a gas cap directly above the oil zone, it is necessary that the gas-oil contact point be determined accurately, and that the casing seat, if the casing is not to be set on bottom, or the position of the perforations, be a safe distance below this contact. The number of shots placed per foot of hole varies widely among the operators, and the proper number that should be placed is still open to conjecture. After perforating, or after setting the screen, the tubing is run to a point, usually within 100 feet of bottom, and the christmas tree put on. The mud is washed out with water, the water washed out with oil, and if necessary the well is swabbed. As soon as the well shows life it is put on a small choke, and is cleaned on the smallest choke that will permit steady flowing. Cleaning a well in this manner takes from one to four days, and often the well is not thoroughly cleaned after this length of time, but the danger of gas channeling down around the casing and through the perforations makes this practice advisable. The danger of pulling sand into the well bore is also minimized by the practice of cleaning and producing on small chokes, as is the possibility of the coning off bottom water.

Producing Practices

Since most of the fields in this vicinity are comparatively recent, and the wells have been produced under restricted allowables, they are still flowing. They are flowed on small chokes, 24 hours per day, the size of the choke depending on the characteristics of the well and the daily allowable. The choke is usually the smallest that will permit the allowable to be obtained over the 24-hour period. Because of the hazardous sand conditions some operators feel that it is harmful to their wells to shut them in and many wells have been flowed continuously since their completion. Where artificial lifting methods have become necessary both conventional pumping units and gas-lift devices are in service. In the Corpus Christi area where large quantities of water must be handled in order to obtain the production, several types of gas-lift valves are being used. This is a multiple sand field, and gas produced from a gas well completed in one sand is used to produce the fluid from a well completed in another sand. Some compressor plants are in operation which recycle the gas used for lifting purposes. The gas is taken from the separator, compressed, and returned to the well under a pressure great enough to produce the fluid at the desired rate. Flow valves are being used to advantage in a number of other fields where high-pressure gas is available at reasonable cost, but there is some difference in opinion among operators as to whether gas-lifting devices have been sufficiently tried to warrant the expense of installing compressor plants to be used in conjunction with them. Conventional pumping units are widely used in fields that do not present the problem of producing large volumes of water. Considerable sand trouble is experienced in pumping wells, particularly if the well is making some bottom water. The pump is placed 500 to 1,000 feet off bottom if the desired amount of fluid can be obtained from this depth, and often the fluid is produced through a choke, in order to hold some back pressure on the sand. Sand will sometimes cause complete stoppage of fluid production, resulting in expensive clean-out jobs.

The following table gives an estimate of the cost involved in drilling and equipping for production a typical 5,500-foot flowing well in this area:

Drilling, 5,500 ft. at $2.50 per ft.	$12,750.00
Casing:	
1,000 ft. of 10¾-in.	1,700.00
5,500 ft. of 7-in.	7,425.00
Tubing, 5,500 ft. of 2½-in.	2,200.00
Cement	900.00
Cementing	350.00
Electric logging	400.00
Perforating	150.00
Christmas tree	1,200.00
Total	$27,075.00

Equipping the well for pumping will require:

94-ft. derrick	$1,200.00
40-hp. pumping unit and gas engine	4,000.00
Sucker rods, 5,500 ft., ¾-in.	1,050.00
Pump, well-head connection, etc.	300.00
Total	$6,550.00

Equipping the well for gas-lift will require:

94-ft. derrick	$1,200.00
Flow valve equipment, approximately	1,000.00
Packer	125.00
Gas lines, regulators, valves, etc.	800.00
Total	$3,125.00

A number of the fields in this zone are close enough to the coast to permit removal of the salt

TABLE 3—OIL-PRODUCING FORMATIONS—LAREDO AND WEST GULF COAST DISTRICTS OF SOUTHWEST TEXAS

Field and county—	Miocene	Upper and Middle Oligocene	Frio-Vicksburg	Jackson	Cockfield-Yegua	Remarks
Agua Dulce, Nueces	..	G	X	..	..	
Agua Dulce—North, Nueces	..	..	X	..	..	
Albercas, Webb	..	..	..	X	S	
Alfred, Jim Wells	..	..	X	..	..	
Alice, Jim Wells	..	G	X	..	..	
Alsworth, Jim Hogg	..	..	..	X	..	-
Alta Mesa, Brooks	G	X	..	..	..	
Alta Verde, Brooks	X	..	..	..	..	
Angelita, San Patricio	..	..	X	..	..	
Aviator, Webb	..	..	..	X	..	Show in Cook Mountain
Baldwin, Nueces	X	..	..	..	..	
Bandera, Jim Wells	..	..	..	G	..	Makes distillate
Barbacoas, Starr	..	G	X	..	..	
Bentonville, Jim Wells	..	G	X	..	..	
Bird Island, Kleberg	..	..	G	..	..	Makes distillate
Bruni and East Bruni, Webb	..	..	..	XG	X	
Caesar, Bee	..	..	..	..	X	
Callihan, McMullen	..	..	..	X	X	
Carolina-Texas, Webb	..	..	..	XG	XG	Show in Mt. Selman
Casa Blanca, Duval	..	..	..	X	..	
Cedro Hill, Duval	..	..	..	X	..	
Chapman Ranch, Nueces	..	X	X	..	..	
Charamousca, Duval	..	..	..	X	..	
Charco Redondo, Zapata	..	..	..	X	..	
Church, Bee	..	..	..	G	..	Some distillate-abd.
Clara Driscoll, Nueces	G	X	X	..	..	
Clara Driscoll—South, Nueces	G	X	X	..	..	
Coletto Creek, Victoria	..	X	X	..	..	
Colmena, Duval	..	..	X	..	..	
Colorado, Jim Hogg	..	..	..	..	X	
Comitas, Zapata	..	..	..	X	..	
Cordele, Jackson	X	..	..	..	..	
Crowther, McMullen	..	..	..	X	..	Abandoned
Cuellar, Zapata	..	..	..	..	X	
Diamond Half, Goliad	..	..	..	..	X	
Dinero, Live Oak	..	..	..	..	X	
Dirks, Bee	..	..	..	..	X	
Driscoll, Duval	..	..	G	X	..	
Eagle Hill, Duval	..	..	..	X	..	
Escobas, Zapata	..	..	..	X	X	
Ezzell, McMullen	..	..	..	X	..	
Fitzsimmons, Duval	..	..	..	X	X	
Flour Bluff, Nueces	..	X	..	..	..	
Foley, Bee	..	..	..	G	X	
Fort Merrill, Live Oak	..	..	..	..	X	
Francitas, Jackson	..	..	X	..	..	
Ganado, Jackson	..	X	..	..	..	
Government Wells, Duval	..	..	..	X	..	
Greta, Refugio	G	X	X	..	..	
Guerra (Cuervitas), Starr	..	..	..	X	..	
Henne-Winch-Faris, Jim Hogg	..	..	..	X	S	
Heyser, Calhoun	G	S	X	..	..	
Hoffman, Duval	..	..	..	X	..	
Hord's Creek, Goliad	..	..	..	..	X	
Ignacio, Duval	..	..	..	X	..	
Jacob Ranch, McMullen	..	..	..	G	X	
Keeran, Victoria	..	X	X	..	..	
Kelsey, Brooks and Jim Hogg	..	..	X	..	..	
Killam, Webb	..	..	..	X	S	
Kimble, Bee	..	..	..	..	X	Abandoned
Kingsville, Kleberg	XG	..	..	..	..	
Kohler-Rancho Solo, Duval	..	..	..	X	..	Show in Mt. Selman
Labbe, Duval	..	..	..	X	..	
La Blanca, Hidalgo	..	..	X	..	..	
Lamar, Aransas	..	..	G	..	..	
La Rosa, Refugio	..	..	X	..	..	
La Sal Vieja, Willacy	..	..	X	..	..	Abandoned?
Las Animas, Jim Hogg	..	..	..	X	..	
Laurel, Webb	..	..	G	G	X	

(Continued on Next Page)

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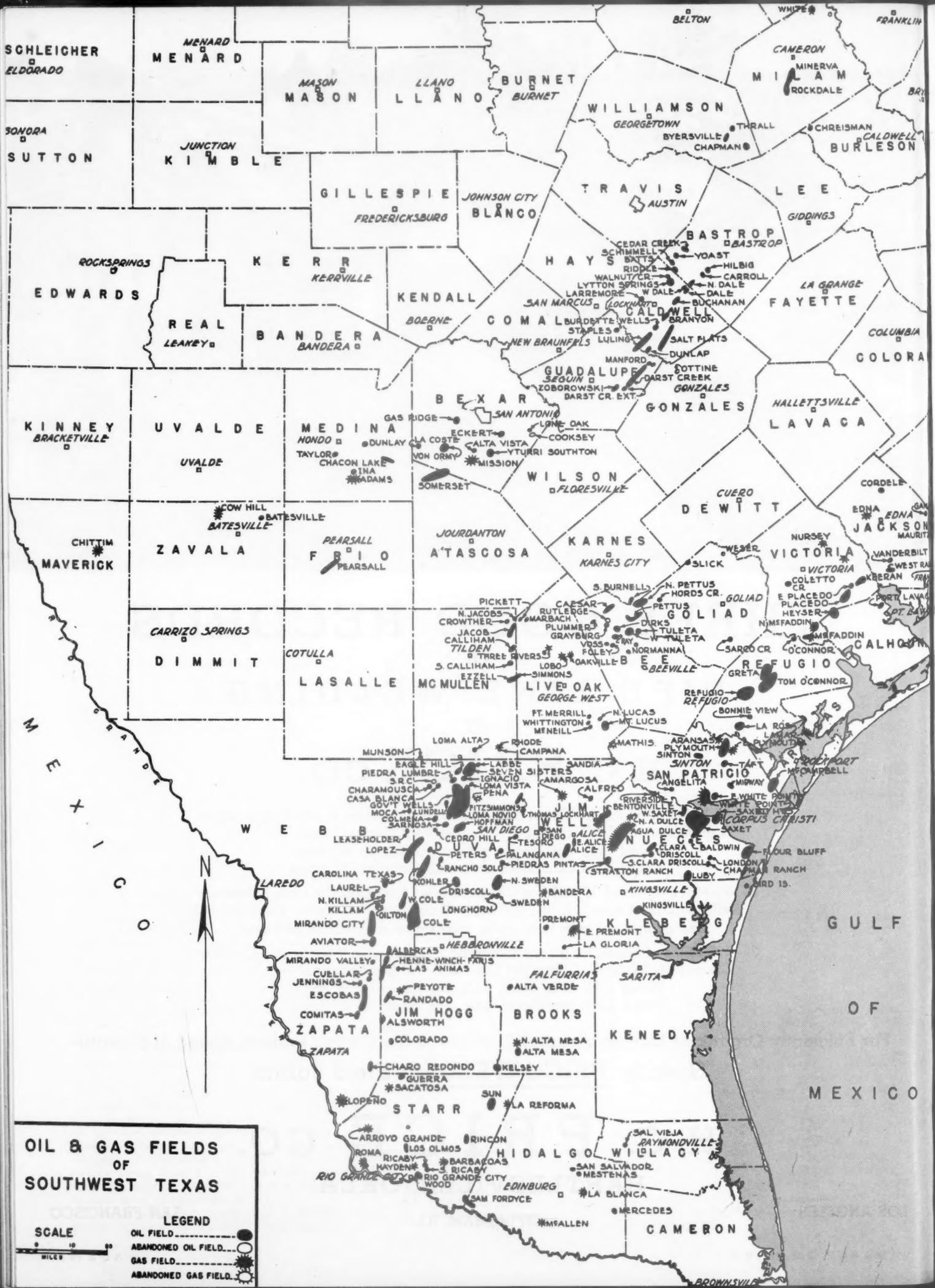
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COLORADO
N. ALTA MESA
ALTA MESA
ZAPATA
CHARO REDONDO
KELSEY
GUERRA
SACATOSA
LOPENO
STARR
SUN
LA REFORMA
ARROYO GRANDE
RINCON
SAL VIEJA
RAYMONDVILLE
LOS OLMOS
ROMA
HIDALGO
WILLACY
RICABY
HAYDEN
BARBACOAS
S. RICABY
SAN SALVADOR
MESTENAS
RIO GRANDE CITY
WOOD
EDINBURG
LA BLANCA
SAM FORDYCE
MERCEDES
MISSION
CAMERON
BROWNSVILLE
GULF OF MEXICO
MEXICO
OIL & GAS FIELDS OF SOUTHWEST TEXAS
SCALE
0 10 20
MILES
LEGEND
OIL FIELD
ABANDONED OIL FIELD
GAS FIELD
ABANDONED GAS FIELD

water produced with the oil into the Gulf. Operators in other fields dispose of their water by evaporation, or by putting it into salt water sands through water-disposal wells.

ZONE NO. 2

This zone, comprising the area from Goliad County to Zapata County, has had producing fields for a number of years, and newer fields are currently being discovered along the trend.

The region is comparatively flat, slightly rolling, the surface being composed mostly of a sandy loam. During favorable weather, the terrain conditions permit comparatively easy movement of equipment and the rigs are often skidded for several locations. The roads are bad in wet weather, but the rainfall in this area is so much less, and the drainage so much better than that along the coastal plains that it is usually not considered necessary to surface lease roads.

All wells are drilled with rotary rigs. The absence of dependable creeks and rivers, and the chemical composition of much of the underground water makes the use of gasoline or Diesel rigs practical. Much smaller rigs are in use here than in Zone No. 1, as the drilling depth seldom exceeds 4,000 feet. The usual steam rig consists of a 122-foot derrick, two 110-hp. boilers, one 16-inch pump, and a 12-inch by 12-inch engine. The usual mechanical rig will consist of two 125-hp. engines and a 16-inch pump.

Thirty to 200 feet of 10¾-inch surface casing is set and cemented in approximately 15-inch hole and allowed to set from 24 to 48 hours before drilling the plug. Seven to 8-inch hole is drilled down to the producing horizon and 5½-inch casing set. Since the danger of high gas-oil ratios in this area is slight, the practice of setting casing on bottom and perforating is not so common, as the perforating is considered an unnecessary expense. If the casing is set on top of the sand, a perforated liner is landed on the bottom of the hole. The use of screens has been found to be unnecessary in practically all the fields.

The tubing is usually placed about 100 feet from the bottom of the hole and equipped with a working barrel or seating nipple, as the period of the flowing life for these wells is fairly short. The mud is flushed out with water and water flushed out with oil, and if natural flow is expected, the well is swabbed. Otherwise a pumping unit is placed over the well and the water or oil pumped out. The 122-foot drilling derrick is replaced with a 73-foot pumping derrick.

The producing sand found in some of these fields contains a comparatively high percentage of bentonite, which presents a production problem not often found in other areas. The bentonite, upon coming in contact with fresh water, will swell and form a thick paste which will tend to clog the sand pores and the area between the liner and the open hole. In the drilling of some wells sands have been encountered which were apparently as rich as those found in producing wells, yet little or no production has been obtained from them; this apparently being due to a clogging of the sand pores with the bentonitic paste, formed when the bentonite comes in contact with the fresh water from the drilling fluid, or the water used in washing the well. It has been found practical in fields where this is prevalent to set casing before the producing zone is reached, then drill into the sand, using oil as the drilling fluid. Brine is sometimes used as a drilling fluid in place of oil with satisfactory results, since the swelling of the bentonite is appreciably less in salt water than it is in fresh water.

The shallow depth of these wells, and the favorable terrain conditions have made the use of central pumping powers very practical. The wells are equipped with common working barrels and are pumped with five-eighths inch sucker-rods. Over-all lifting costs as low as 20 cents per barrel for pumping wells in these fields are quite common.

The following is an estimate of the cost of drilling and equipping a 2,500-foot well to produce in this area:

Drilling, 2,500 ft. at $2 per ft.	$ 5,000.00
Casing:	
100 ft. of 10¾-in.	170.00
2,500 ft. of 5½-in.	2,000.00
Tubing, 2,500 ft. of 2-in.	750.00
Cement	250.00
Cementing	350.00
Pumping derrick	800.00
Pumping jack	180.00
Sucker-rods, 2,500 ft. of ⅝-in.	375.00
Power (1 to 15 wells)	1,100.00
Rod lines, stakes, well-head connection	600.00
Total	$11,575.00

The wells along this trend usually do not produce a great amount of salt water and earthen pits have proved adequate for water storage and evaporation.

ZONE NO. 3

This area comprises some of the oldest fields in Texas, and still accounts for a fair percentage of the state's oil production. The greater part of the commercial production at the present time is from wells completed in the Austin chalk or the Edwards limestone at depths varying from 700 to 2,700 feet. The gravity of the oil varies from 30 to 39° A.P.I.

All the recent drilling has been done with small rotary rigs, some of which are portable. The steam rigs in use consist of two 100-hp. boilers, one 14-inch pump, a 10-inch by 10-inch engine, and a 94-foot derrick. Small gasoline rigs,

TABLE 3 (Continued)

Field and county—	Miocene	Upper and Middle Oligocene	Frio-Vicksburg	Jackson	Cockfield-Yegua	Remarks
Leaseholders, Webb	..	..	G	X	..	Abandoned
Loma Alto, McMullen	..	..	..	X	..	
Loma Novio, Duval	..	..	..	X	..	
Loma Vista, Duval	..	..	..	X	..	
London, Nueces	X	X	..	..	..	
Longhorn, Duval	..	..	..	X	..	
Lopeno, Zapata	..	..	..	..	..	Gas and show oil in Queen City, Mt. Selman age
Lopez, Webb	..	..	..	X	..	
Los Olmos, Starr	..	..	X	..	..	
Luby, Nueces	X	X	S	..	..	
Lundell, Duval	..	..	..	X	..	
Mauritz, Jackson	..	..	X	..	..	
McCampbell, Aransas and San Patricio	..	X	X	..	..	
McFaddin—North, Victoria	G	X	G	..	..	
McNeill, Live Oak	..	..	..	X	X	
Mercedes, Hidalgo	..	..	X	..	..	
Mestenas, Hidalgo	..	..	X	..	..	
Midway, San Patricio	..	X	..	..	..	
Mirando City, Webb	..	..	..	X	X	
Mirando Valley, Zapata	..	..	..	X	X	
Moca, Webb	..	..	..	X	..	
Mt. Lucas, Live Oak	G	G	GX	X	X	
Munson, McMullen	..	..	..	X	..	
Normanna, Bee	..	..	G	X	X	
Oakville, Live Oak	..	G	..	X	X	
O'Connor-McFaddin, Refugio and Victoria	..	X	X	..	..	
O'Hern, Webb	..	..	..	..	X	
Oilton, Webb	..	..	..	X	S	
Palangana, Duval	X	..	..	..	..	Very small production
Peters, Duval	..	..	..	X	..	
Pettus, Bee	..	..	G	..	X	Show in Cook Mountain
Pettus—North, Bee, Goliad and Karnes	..	..	..	..	X	
Piedra Lumbre, Duval	..	..	..	X	..	
Piedras Pintas, Duval	X	..	X	X	..	
Placedo, Victoria	..	X	X	..	..	
Placedo—East, Victoria	..	..	X	..	..	
Plummer, Bee	..	..	..	..	X	
Plymouth, San Patricio	..	..	X	..	..	
Plymouth—East, San Patricio	G	..	..	..	..	
Port Lavaca, Calhoun	..	X	..	..	..	
Premont, Jim Wells	..	X	..	..	..	
Premont—East, Jim Wells	..	..	X	..	..	
Randado, Jim Hogg	..	..	..	X	..	
Ray, Bee	..	..	..	..	X	
Refugio, Refugio	G	X	X	..	..	
Reiser, Webb	..	..	..	S	G	
Ricaby, Starr	..	..	X	..	..	
Ricaby—South, Starr	..	..	X	..	..	
Rio Grande City, Starr	..	..	X	..	..	
Riverside, Nueces	..	..	GX	..	..	
Roma, Starr	..	..	..	..	G	Small amount oil from Queen City-Mt. Selman age
Rutledge, Bee	..	..	..	..	X	Abandoned
S. R. C., Duval	..	..	..	X	..	Abandoned
Samfordvce, Hidalgo and Starr	..	..	X	G	..	
Sandia, Jim Wells	..	G	X	S	..	
Sarnosa, Duval	..	..	..	X	..	
Saxet, Nueces	G	X	X	..	..	
Saxet Heights, Nueces	X	S	..	..	..	
Saxet—West, Nueces	X	X	X	..	..	
Seven Sisters, Duval	..	..	..	X	..	
Sinton, San Patricio	..	..	X	..	..	
Slick, Goliad	..	..	..	..	X	
South Burnell, Karnes	..	..	..	..	X	
Stratton Ranch, Nueces	..	..	X	..	..	
Sun, Starr	..	..	X	..	..	
Sweden, Duval	..	..	..	X	X	
Sweden—North, Duval	..	..	X	X	X	
Taft, San Patricio	X	X	..	..	..	
Telferner, Victoria	S	..	G	..	..	
Telferner—East, Victoria	..	..	X	..	..	
Tesoro, Duval	..	..	..	..	X	
Thomas-Lockhart, Duval	..	..	..	..	X	
Tomoconnor, Refugio	G	S	X	..	..	
Tuleta, Bee	..	..	..	..	X	
Tuleta—West, Bee	..	..	..	X	X	
Vanderbilt, Jackson	..	..	X	..	..	
Voss, Bee	..	..	..	..	X	
Weser, Goliad	..	..	..	..	X	Died after producing small amount oil. Show in Cook Mountain
West Cole, Webb	..	..	..	X	XG	
West Ranch, Jackson	..	X	..	..	..	
White Point, San Patricio	G	X	..	..	..	
White Point—East, San Patricio	..	..	X	..	..	
Whittington, Live Oak	..	..	..	..	X	

Note: X = Oil production. G = Gas production. S = Show of oil or gas

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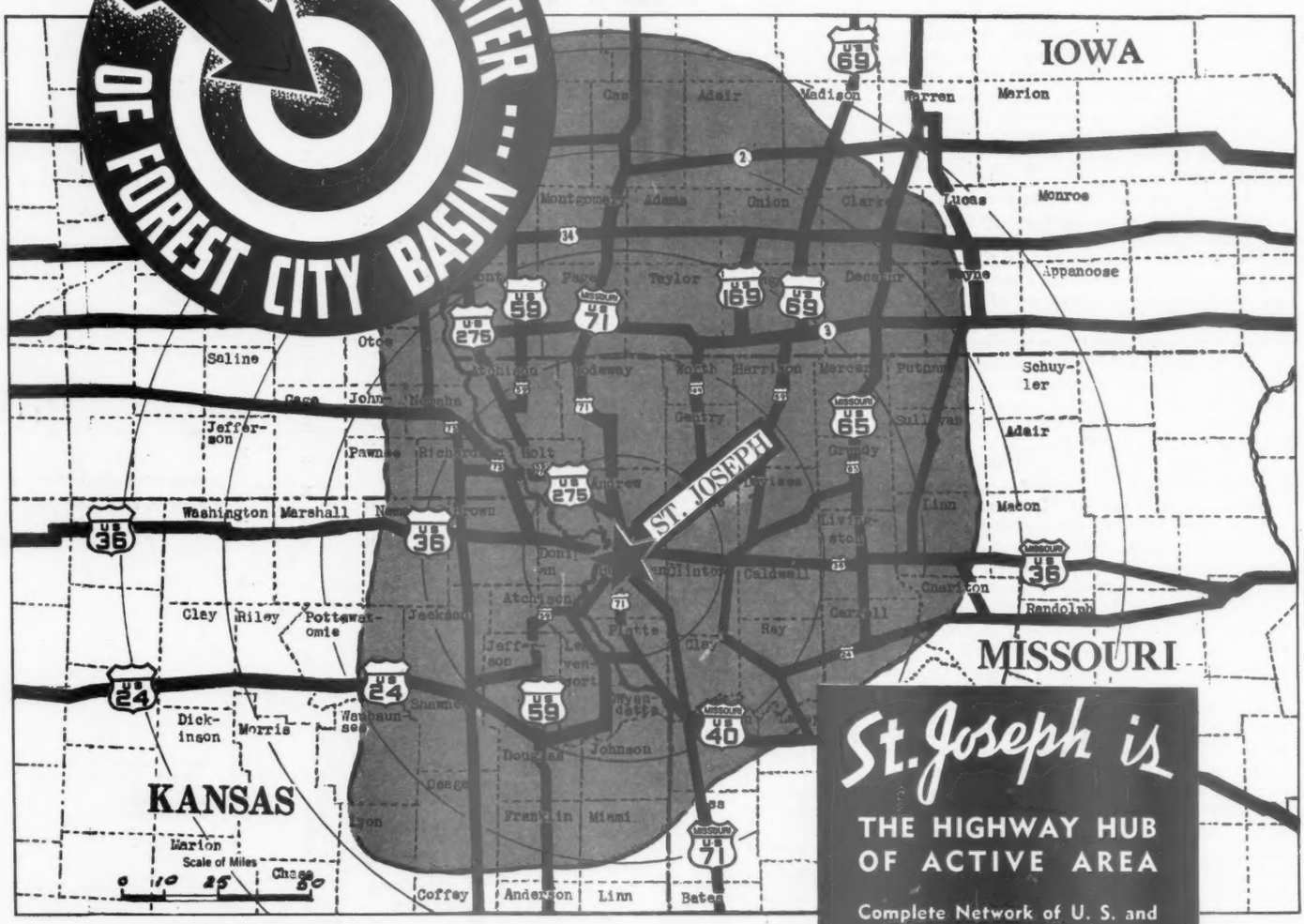

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mounted on trucks, are competing favorably with the steam rigs on the shallow drilling. Derricks much shorter than 94 feet, often made of wood, are used occasionally, and left over the well for production purposes. Natural gas is not available at a reasonable cost in most of the fields and fuel oil has been found to be more economical for steam drilling. Boiler water, which usually requires little or no treatment, can be obtained from nearby creeks and rivers or from shallow water wells.

From 30 to 100 feet of 10¾-inch surface casing is set in the wells, usually cemented by the drilling crew. Very little coring is necessary as the geological formations can be easily detected from cuttings or by the action of the bit. Five and one-half inch, or 7-inch casing is set on top of the producing formation and a perforated liner placed below the casing, opposite the oil pay.

The wells producing from the chalk or limestone horizons are completed by swabbing, given an acid treatment if needed, then put on the pump for production. Some of the wells, particularly those completed in the chalk, must be acidized before any production is obtained. Others will produce without the acid treatment, but must be treated periodically as the production drops off. Very few of the wells are completed as flowing wells, most of them being put on the pump as soon as completed. Central pumping powers have been found practical for use in this area, most of the leases being produced by them. The wells are equipped with common working barrels and five-eighths inch sucker-rods. Hydrogen sulfide gas is present in some of the fields, adding an expensive corrosion problem to the lease upkeep.

The estimated cost of drilling an average 2,500-foot well into the Edwards limestone and equipping it to produce is shown in the following:

Drilling, 2,500 ft. at $1.75 per ft.	$ 4,375.00
Casing:	
100 ft. of 10¾-in.	170.00
2,500 ft. of 5½-in.	2,000.00
Tubing, 2,500 ft. of 2½-in.	1,000.00
Pumping derrick	800.00
Acidizing	500.00
Pumping jack	180.00
Pumping power	1,100.00
Rod lines, rod stakes, well-head connection, etc.	600.00
Total	$10,725.00

Acknowledgments

The writers acknowledge the helpful cooperation of Herschel H. Cooper, Joseph M. Dawson, Milo Orr, C. C. Miller, Fred Shayes, Arch Maley and J. M. Hansell in the compilation of the charts showing the relationships of production to the geological formations. Thanks are due to C. A. Warner and Phil Martyn of Houston for early historical data and to C. H. Coldwell for his assistance in drafting map and chart. Appreciation is extended to John A. Ritter of Dallas for his constructive criticism and assistance in the preparation of that part of the paper dealing with production practices.

Kinematic Viscosity in Testing Motor Oils Recommended

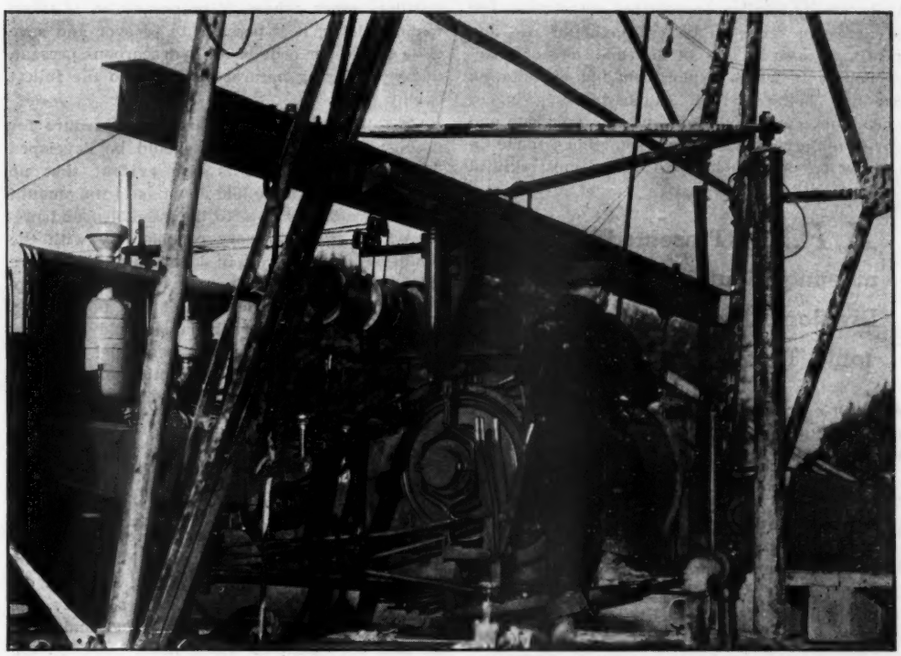
The subcommittee on sligh oxidation test voted to recommend that no further work be done in developing this test method, and that the subcommittee be discharged.

Subcommittee XIX on illuminating oils proposes that Method D-187 covering the burning quality of kerosene oil be amplified to interpret the condition of the flame, chimney and the wick at the conclusion of the burning test.

Subcommittee XXIII on carbon residue reported data resulting from cooperative work in which comparisons were made between the present Conradson carbon residue and Ramsbottom carbon residue methods. The results indicated that the Ramsbottom method was equally satisfactory both from a reproducibility and a manipulation standpoint. The subcommittee contemplates recommending that the Ramsbottom method be adopted as a tentative standard.

Technical Committee B on lubricants announced that it contemplates sponsoring a round-table discussion at the society's 1939 annual meeting in Atlantic City of the same general character as the one held the year previous. The gum section of Technical Committee A on gasoline reported on the analysis of the exhaustive cooperative study which has been conducted during the past two years in attempting to correlate laboratory tests with the storage of gasoline.

SAFETY — Roller Protects Driller From Spinning Line



Drilling crews frequently make additions or alterations to rigs which will make their work safer or easier. The 4-inch vertical roller from the floor to the V-brace from the head-board is an addition which is a protection for the driller and crew because it makes the driller's work safer, easier, and more convenient.

Newer types of portable rigs are designed for compactness as they are frequently loaded on a truck as a unit. While a roller on the jack-post is provided for guiding of the spinning line, not enough room is left for the driller's position while spinning up of the drill pipe is in progress. The spinning rope, when it is tight, passes through the place which could most comfortably and conveniently be occupied by the driller while he is in position to control the rig.

The driller has three choices: he can "hug" the side of the drawworks and have the rope rubbing across his back and neck; he can stoop low and have the rope passing over his head; or he can leave the controls of the machinery and step under the line and back. In the first case he is in no position for rapid and complete control of the rig and in case the rope should break (a frequent occurrence) he would be in the correct position to get slapped in the face with the end of it; there is also the possibility of the driller becoming entangled in the end of the rope and jerked into the cathead. The same is true of the second alternative. If the driller steps back he is some distance from the controls and in case of emergency he would have some difficulty in stopping the rig. While he is out of danger from the rope, danger to the backup man and cathead man is increased; if either one should become fouled in the rope, it would take the driller entirely too long to stop the turning of the cathead.

Spinning lines are always a source of danger due to their breaking or fouling. The cathead man has to get away from the cathead very quickly to prevent his becoming fouled in the line in case it breaks. Fouling of the line is equally as bad as there is not only danger to the cathead man but also to the backup man in this case. Rubbing of the line across the driller's neck is always unpleasant to the driller, particularly if the rope is wet and muddy.

By installing the long roller and extending the cathead, the rope is detoured around the driller and he can stand in a normal position at the controls without inconvenience or danger. In case the rope breaks or fouls or either the cathead man or the backup man becomes entangled, the driller can immediately stop the rig. It is also a saving in time to the contractor as the rig can be handled more rapidly when the driller does not have to assume odd postures to avoid being struck by the spinning line; time per trip is thus reduced.

Well Completion Data Obtained in Oil Field Development

By S. F. BOWLBY
Shell Petroleum Corp.

In recent years improvements in drilling and completion technique, as well as the introduction of electrical measuring devices, have placed at the disposal of the oil industry a set of tools which require appreciable correlation and accuracy in order to be of maximum use and profit, more so because of the conditions of greater depths to which exploration and exploitation are now being carried. Furthermore, stringent curtailment of production tends to obliterate and cover up errors which are sometimes made in completion practice in spite of the most skillful engineering technique, and it is not until large investments have been made that such errors become evident.

A.P.I. — Presented before meeting Southwestern District, Division of Production at San Antonio, Texas, March 16-17, 1939.

In the Gulf Coast area in particular the difficulties inherent to greater depths are further complicated by the fact that oil is found to saturate only a comparatively thin section of a sand body, is overlain almost completely by gas and underlain by water on all points of the accumulation. These thin oil columns, as they are often called, require special attention, because even if it is possible for an operator to develop his properties which are embraced by such a reservoir on a wide spacing pattern, the completion technique should be such that the maximum drainage, both vertical and lateral, may be obtained. Had development problems of this nature arisen a few years ago before the present refinements in measuring devices and completion practice had been adopted, the chances of success would have been negligible, as it is evident that it is no longer possible to drill a well into such a reservoir and produce it by rule of thumb practices of long standing. Even though such practices still maintain in ordinary cases, the modern operator will only complete wells under the difficult conditions mentioned after he has taken full advantage of the help offered by modern science.

A better understanding of the reservoir and its contents, obtained through early and detailed observations and proper interpretation, has made it possible to take immediate action in determining the best completion procedure. Although considerable improvement still can be made in the accuracy of determinations of the content of reservoirs, present technique has made it possible to obtain reliable figures for the amount of oil in place and has shown that appreciable quantities of water are present in the void space of most oil-bearing formations. As a consequence, it is now anticipated that the improved methods of completion and production will recover a far greater percentage of the oil underground than formerly estimated. This is particularly true with regard to the exploitation of high-pressure gas distillate zones, where, if proper action is taken without delay, it is possible to recover and save close to 100 per cent of all hydrocarbons present, thereby utilizing natural resources to the fullest extent.

It follows that a standardized procedure for taking and recording data should be developed in each field, but it is also evident that no stringent rules can be laid down as to the amount and nature of the data to be assembled and preserved, as this will vary considerably with the conditions encountered. In determining the nature of the data to be obtained early in the development of a field, experience is of first importance, and the collection of such data should be under the immediate direction of a personnel of broad training even though the collection of this data has in recent years become somewhat of a routine procedure.

It is in this direction that the following summary of data, which can be collected and the manner in which they may be preserved, has been prepared.

Generally speaking, records may be of two kinds, firstly, the written record providing the historical background and including all minor details in the drilling of a well, and secondly, the graphic record, of which the well logs and cross sections are examples which have, however, undergone considerable change and improvement on account of the advanced technique and greater variety of physical constants measured and recorded thereon. While the written record is necessary to provide all of the details concerning a well, nevertheless it is of limited value for comparative study and coordination of data in undertaking difficult completions, and in this instance graphic records are indispensable.

In discussing well completion data, it will be assumed that all of the details as to geologic correlation, such as paleontology and structural correlation in connection with the use of the electrical log, have already been undertaken, and the reader is familiar with the graphic formation symbols used in the illustrations. The primary considerations, therefore, hinge about (*a*) data necessary before the actual mechanical completion can be determined, which, for reference, will be called "basic completion data." These data are also meant to include such information as is necessary to determine well density required, and in general all factors which may influence the development of the particular structure. (*b*) "Actual completion data" pertaining to the mechanical details, and (*c*) "performance data" which, of course, are proof of the conclusions reached under (*a*) and (*b*).

Basic Completion Data

The necessity of accurately locating any subsurface point in a well, as well as the degree of accuracy of the various means of obtaining depth measurements, has recently been discussed at some length in a paper by C. E. Reistle, Jr., and S. T. Sikes, Jr., entitled "Well Depth Measurements," dated May 25, 1938.* Of all of the basic data which are necessary to effecting a satisfactory completion, particularly the selective completions which are now being undertaken, accurate measurements are probably the most im-

*Presented at the mid-year meeting of the American Petroleum Institute, Wichita, Kans., May, 1938.

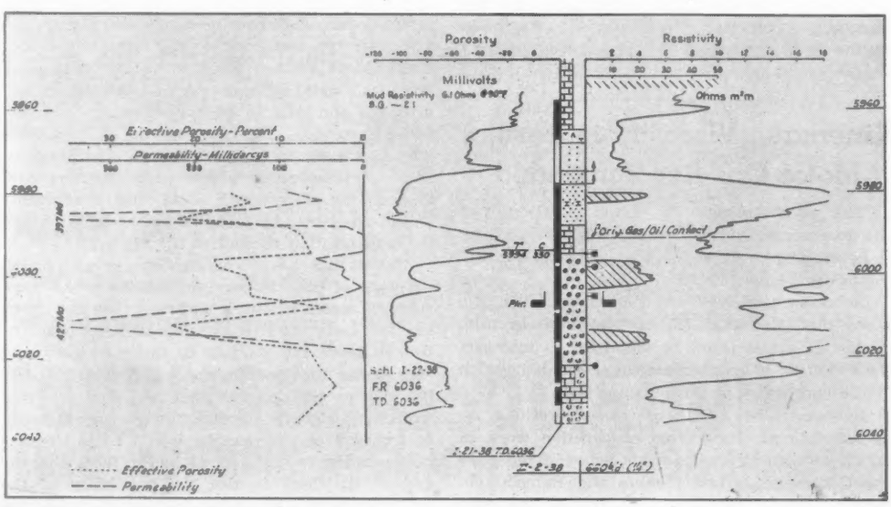


Fig. 1—Completion record, limestone field

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portant. The importance of proper measurements is fully recognized when one considers the attention that mechanical depth measuring devices are receiving. It is the writer's opinion that even though mechanical devices for recording depth are, on the whole, largely satisfactory, nevertheless the drill pipe and sand line measurements still should be regarded as the standard of comparison, since conditions beyond the control of the operator make it possible to err when using mechanical devices.

In indicating measurements on the graphic record, as well as in the written record, the maximum amount of possible error should be apparent at once, for example on Figure 1, the possible discrepancy of the depth at which the electric log was run and the electric log depth measurement itself are shown.

Until recently it has been necessary in order to obtain the character and content of the formations penetrated to take formation cores with the so-called "conventional" core barrel which is attached to the drill stem and necessitates a round trip each time a core of a maximum length, seldom exceeding 20 feet, is taken. Such procedure is and always was costly. The steadily increasing depth to which wells, particularly exploratory wells, are now drilled confronts the engineer or geologist seeking information with evermounting cost of obtaining conventional cores. This cost factor, recognized at a rather early date, in turn has led to the development and general adoption of wire line core barrels and practices, until at this time wire line coring has in many instances entirely replaced the old-time conventional core.

Second only to accurate measurements in basic well completion data, core analyses play an important part in the essential information to be assembled, and, as will be seen, the graphic presentation of such data is of equal importance.

It has been general practice until quite recently to examine a core at the surface for its appearance, either cut, smell and taste, and subsequently for paleontological information. It has become evident, however, that in limiting core

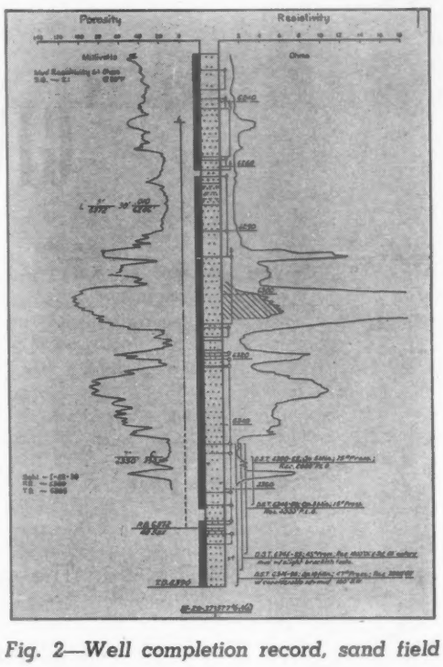

Fig. 2—Well completion record, sand field

examinations solely to these superficial points the operator is not obtaining the maximum information from the money which has been spent in coring, which even with the general adoption of wire line coring practices, is still a rather costly procedure when compared with drilling. Appreciably more data on cores became available when those which contained some evidence of petroleum were canned in air-tight containers and forwarded to a distant laboratory for complete analysis. At present the utilization of laboratories brought directly to the well makes it possible to make use of these data without any delay. However, since the costs of coring in any case are still important factors in drilling costs, there is a growing tendency to rely on the electrical log with its recent improvements in lieu of coring, and in case of doubt as to the contents of the horizon penetrated, rely on cores taken from the walls of the hole with devices which are now available. Though the idea of side wall coring in itself is not new, the devices by which such cores may be taken and particularly the technique of operation has improved to a considerable degree.

With the growing use of core analyses in basic completion data, as well as a factor in forecasting the performance of the reservoir itself, attention is drawn to the physical constants in a core which may be analyzed with accuracy. Foremost among these are, of course, permeability and porosity, the latter determining the maximum amount of void space that hydrocarbons can occupy in a unit volume of formation; permeability indicating the resistance to extraction of oil if not having a direct influence on the degree of saturation of the oil-bearing formations. Aside from these two main points in core analysis, the other major ones may be enumerated as follows: Oil saturation, water saturation, chloride content, solubility in HCl, grain size and colloidal content. Any one or all of the foregoing analyses to which cores lend themselves may become of first importance, depending upon the problem under consideration, and since electric logging is affected

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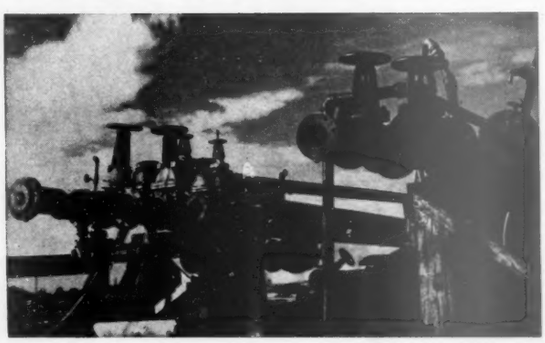

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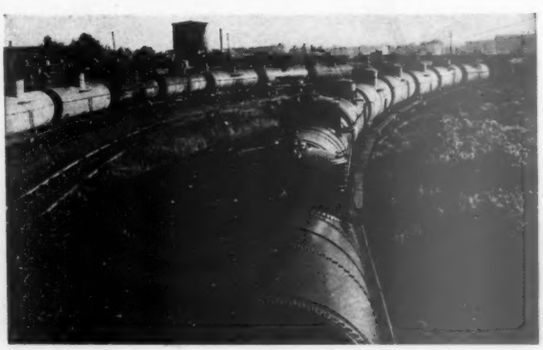

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by these constants also, they are of certain use as an aid in interpreting the electric log. Any or all of these points also lend themselves to graphic presentation.

Advances are constantly being made in core analysis technique, and at least one private laboratory operating on a service basis contends that through comparison in a great number of cases it is now able to forecast with some degree of accuracy the gas-oil ratio of a particular well and possibly the productivity index as well. Several operators are attempting to make analyses upon fragmentary drill cuttings although such work as yet appears to be inconclusive. At the risk of unnecessary repetition, it should be stressed that unless cores are subject to some sort of analysis other than those of a superficial nature, an operator is not receiving the most for his money.

A method of indicating the cored interval and core recovery itself is shown on the left-hand side of the graphic log, illustrated in Figure 1, as well as some of the other illustrations accompanying this paper. In this method, the recovered portion is shown solid, while the nonrecovered portion is left blank. This manner of recording, when accompanied by the indicated content shown best in Figure 2 on the right-hand side of the log, gives a ready reference of basic core data to be used in formulating actual completions. Particularly in limestone reservoirs where porosity and permeability vary considerably over a short vertical interval, it is frequently desirable to include with the graphic log a permeability profile (refer Figure 1) as a distinct aid in a selective completion and further as an aid in correlating "pay streaks" within the reservoir.

The electric log is now used in the majority of areas where exploitation or exploration is carried on, except in those areas where it is either nondiagnostic due to peculiar local conditions or is not recognized as an economic necessity. Rather recent developments in electrical logging have increased its value appreciably so that its use not only made possible a considerable advance in completion technique, but in drilling practice itself through facilitating the adoption of "slim hole" drilling methods.

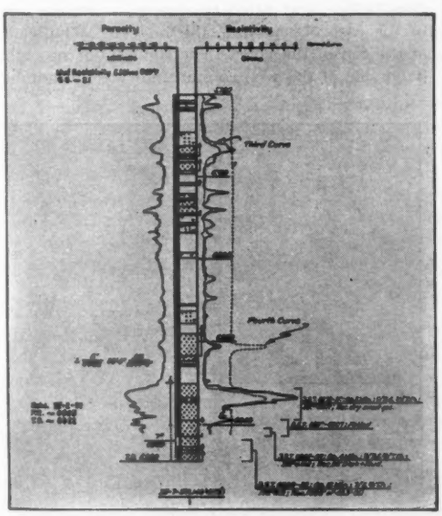

Fig. 2a—Well completion record, sand field

While there is a vast amount of quantitative as well as qualitative research work yet to be done in electric logging, nevertheless the improvements, especially in connection with the lateral investigation diagrams, commonly known as the "third" and "fourth" curves, have materially aided in the difficult completions which are now being undertaken, and in many instances it is entirely through the able assistance of such devices that these completions may be effected.

There has been argument as to the choice of scales to be used for the detail log of the producing section and this choice depends somewhat upon the scale of the overall electric log itself. Since its inception, the electric log has been furnished the operator on a scale of 1:100, and as these logs have been used primarily for geological correlation, this scale would seem to be entirely satisfactory. However, it is too small a scale for detailed study of the producing interval. Since this is true, the producing section must be logged on a larger scale, and it is the writer's opinion that a scale of 1:20 has the greatest utility with regard to basic completion data. This scale will, in many instances, enable a correlation within the producing section itself, thereby giving a better understanding to reservoir anomalies. For example, thin impervious strata whose identity and value may be lost in diagnosing reservoir conditions on the small scale log, may be readily discernible upon the large scale log.

While the interpretation of the electric log is in itself a separate subject, several points in this connection are worthy of consideration here. The porosity curves, a misnomer which has grown through common usage, relates more the permeability due to the component of electric current generated by infiltration. This is found to be true in many fields where the so-called "porosity curve" correlates well with permeability obtained from cores (Figure 1).

Resistivity diagrams true to their name indicate the combined resistivity of formations and their contents. These diagrams, including the third and fourth curves, are dependent somewhat upon the resistivity of the mud fluid in the well.

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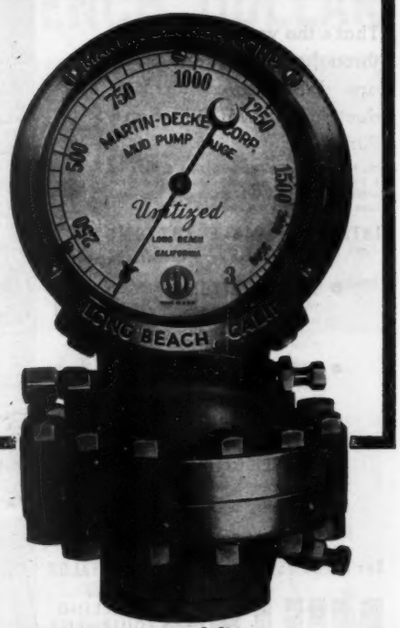

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Therefore the resistivity of the mud, as well as the temperature at which such measurement is made, should appear on the log along with other basic data. One of the principal reasons for the adoption of the third and fourth curves was to rectify the effects of infiltration from the drilling fluid by measuring formation resistance in a larger electrical field and hence at greater lateral penetration. Since the amount of such infiltration is dependent upon the characteristics of the drilling fluid, its properties should also be indicated upon the graphic log.

While the electrical log cannot differentiate reliably between gas and oil, it does give an indication of the water level in many cases, and its use in this respect has become rather general. The myriad of variables which affect the resistivity diagram preclude 100 per cent accuracy in such interpretation however. Experience shows it to be good operating practice to carry one of the early wells in a newly discovered field down to the water level, testing progressively at short intervals, once the oil column has been entered with drill stem testing equipment (refer Figures 2 and 2a). This equipment, as well as the technique of operation, has become so generally accepted that it is superfluous to give it further consideration here. Each drill stem test should, however, appear in complete detail in the graphic record as well as the written record, and while not indicated upon the accompanying sketches, it is suggested that when testing in the oil column the bottom-hole flowing pressure be indicated also, as these data are a measure of the permeability of the possible producing horizon. If the data concerning the water level upon the electric log are confirmed by drill stem testing, the latter need not be repeated until wells are drilled in a different structural unit of the field, and possibly not then.

The foregoing paragraphs have given consideration in a general way to the more common basic completion data and the manner in which they should be recorded. There are, however, instances where special consideration is essential. In limestone producing areas it is believed that in coring the producing section the recoveries are apt to be selective, the more porous sections supposedly being lost through disintegration while cutting, so that only the denser, less porous sections are recovered. This has actually proven to be the case in some instances, and in order to improve the information as to the character of the producing section, drilling times curves are used, indicating the actual time to drill 5-foot (10-foot) intervals. These curves, when constructed upon a convenient scale and included with the graphic logs, as shown in Figure 3, give some indication as to the location and extent of the actual producing section.

Since the formations found in limestone producing areas are indurated, their cuttings lend themselves well to microscopic lithological determinations, so that also upon this basis the amount of porous and hence producing section may be determined to some extent. This is particularly true if the information so obtained is indicated upon the graphic record, as shown on the right-hand side of the formation log in Figure 3, where the amounts of porosity have been estimated by the observer in each 10-foot sample. The symbol on the left-hand side of the log in the same illustration shows the relative amounts of good and poor porosity. These data, in conjunction with the drilling time curves, should give a fairly good indication as to the location and extent of the oil-bearing strata through inference that all porous sections will contain oil and gas.

In true limestone producing areas a study of insoluble residues following digestion of the formation sample in HCl offers considerable possibilities for correlation within the reservoir itself, even though the accumulation of oil may be in some cases independent of local structure.

Temperature surveys have a specialized application in the completion problem. While generally useful in locating gas and water, they are particularly helpful in the foregoing case of a limestone producing section in indicating the vertical extent of the gas cap, as shown in Figure 4. Generally, the electrical log in limestone areas has proved to be of less utility than in the coastal or sand producing areas. It is hoped, however, that research, which is now being undertaken, will improve either the interpretation or the character of logs in limestone areas. Strangely enough, there are already limestone producing areas (Rodessa trend for example) where the electrical log has nearly as much utility as in sand areas, and in such cases (refer Figure 1) are essential in effecting a selective completion.

Actual Completion Data

Once the basic completion data are in hand and have been set down graphically, as well as progressively, in the written record, the actual completion may be undertaken. As stated initially, data pertaining to the actual completion are those which involve the mechanical details of completion itself, such as setting and cementing casing and testing thereof, the setting of screen and liners, production packer and so forth, as well as shooting and acidizing. For example, Figure 1 shows that 7-inch casing was cemented with 350 sacks of cement at a depth of 5,994 feet. Similarly, Figure 3 shows that 5½-inch casing was set on a shoulder at 4,270 feet and cemented with 275 sacks of cement and thereafter the shut-off was tested satisfactorily for 30 minutes under 1,000 pounds pressure. A suggested graphic illustration for a liner setting is given in Figure 2 which indicates the amount of blank and screen as well as the gauge of the screen and its location in the well. Figure 3 is an example showing actual completion data in connection with shooting and acidizing. In this illustration the production before and after treatment is shown, and in the case of shooting, the interval is indicated at the top of the chart. The figures on the right-hand side of the well column indicate the number

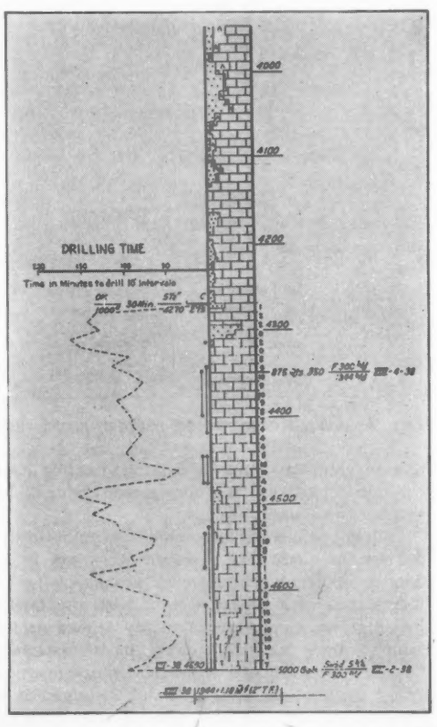

Fig. 3—Completion record, limestone field

of feet of porous section in each 10-foot interval. It should be recognized that from the standpoint of analyzing reservoir performance at a later date, the productivity before as well as after shooting and acidizing is of equal importance to the engineer making such a study.

The data stressed under this discussion may be particularly necessary in effecting the completion itself, since the procedure to be followed has been determined by the basic completion data, never-

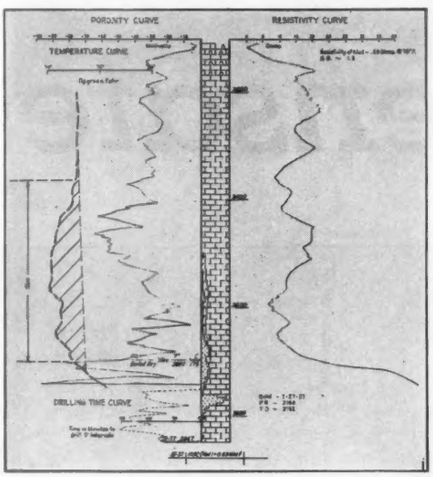

Fig. 4—Completion record, limestone field

theless it is of importance that they be initially recorded graphically as they will be necessary as a ready reference during the productive life of the well and during the remedial work which is sure to come.

Here, as well as in basic completion data, measurements are of the first importance as it is essential that all data be correlated with regard to depth. It might be argued that in planning a selective completion, the final string of casing will be set on bottom and therefore any errors which may be made can easily be rectified. Greater flexibility in procedure is, of course, one of the reasons for so setting casing, but the operator is immediately confronted with the necessity of accurate measurement in gun perforating. It is the writer's suggestion that in addition to the excellent measuring devices employed in such work, the actual perforating depth be checked from a fixed point, the depth of which has been predetermined by drill pipe or casing. Where this is impossible, it would seem advisable to set a plug at a positive point for reference.

Performance Data

Performance records and data are, of course, kept automatically over the life of a well; however, as far as completion data are concerned such data should be very brief, and it is sufficient to say that it is desirable that some standardized procedure be adopted which is readily understandable as well as usable.

It is only necessary as far as completion data are concerned, to give the following information on the graphic record, and a simple procedure is suggested at the bottom of each of the illustrations, particularly Figures 3 and 4.

1. Initial oil production.
2. Initial water production.
3. Initial gas volume.
4. Choke size.
5. Completion date.

All other data may be included in the written record, since it is assumed that more detailed data will be included in the symbols appearing upon the production map.

Conclusions

Usability should be the keynote in assembling data and keeping records, although admittedly we sometimes are not aware initially what data may ultimately become usable and valuable. The data included in the graphic record should only be that which have a correlative value either with regard to other data or other wells, while the written record should be unstinting with regard to all factual details. This is evident when it is realized that the facts are buried thousands of feet in the ground and may never again be repeated in exactly the same manner.

The graphic recording of completion data is of growing importance and thought should be given to standard procedure for the industry to follow, keeping in mind that only simple time saving symbols should be employed. There are several good reasons why the proper recording of completion data is important:

1. Technical—the graphic record is a tool of the engineer and geologist and should therefore be complete and understandable by all.

2. Scientific—the proper recording of actual facts gives the research engineer a background of fact which will eliminate lost motion in this direction.

3. Legal—the graphic record with the subsurface deductions to be made therefrom is admitted as evidence in conclusion.

This paper is intended only to convey certain suggestions as to procedure, particularly in the matter of assembling data and keeping records and naturally is not all inclusive. It is hoped, however, that it may enable further discussions along the same line.

The writer wishes to acknowledge the helpful suggestions of Dr. O. Wilhelm and A. F. van Everdingen in the preparation of this paper.

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Laboratory Study of Condensate

By W. F. FULTON
Chief Chemist, Union Producing Company

Probably the most important single factor in work of this type is making sure that the samples of gas and liquid are truly representative of a well under the desired conditions. To this end the well is allowed to produce at the desired rate for a stabilization period of at least 24 hours before sampling. The sampling period itself may extend over the following 24 hours; during this period the gas flow is metered and the liquid production determined, preferably in the separator. The liquid samples are taken under separator pressure from the separator into steel cylinders by downward displacement of mercury. Gas samples are taken at separator pressure from taps located at the blow-off on the down-stream side of the separator. The containers are fabricated by welding from standard 10-inch pipe. They are provided with two valves, through one of which gas is allowed to enter until the container is at separator pressure. This valve is then closed and the contents of the container are vented to the atmosphere through the second valve. This process is repeated four times after which the maximum contamination of the sample by air or remnants of a previous sample initially present in the container can be shown to be one part in 600,000. Five containers of gas are taken.

A gas sample is analyzed by Podbielniak low-temperature fractionation for all hydrocarbon constituents lighter than heptanes, Figures 1 and 7; nitrogen is determined by interferometer in the methane fraction, carbon dioxide by absorption in potassium hydroxide. A 50-cc. cylinder of the liquid is analyzed and the volume, density and molecular weight of the heptanes and heavier fraction are determined in order that the analysis can be reported in terms of mole percentages.

A mercury piston is used to compress the gas from separator to the desired reservoir pressure. To this end the gas sample containers, Figure 1 (1), are connected into a manifold which communicates by a suitable arrangement of valves with the 1,500-cc. cylinders, Figure 1 (2, *a* and *b*), and Figure 2, which are electrically heated and thermostated to within ±0.2° F. at reservoir temperature. The gas is allowed to fill these cylinders and the experimental recombination bomb, Figure 1 (3) and Figure 3, likewise thermostated at the desired temperature. The mercury piston used to compress the gas operates in cylinder, (2) of Figure 1, and Figure 2. For pressures over 2,000 pounds per square inch the mercury pump, Figure 1 (4), is used to inject mercury into the bottom of cylinders, Figure 1 (2, *b*), and thus to compress the gas into cylinder, Figure 1 (2, *a*), and into the bomb, Figure 1 (3). When approximately 1,500 cc. of mercury have been pumped from the calibrated reservoir of the mercury pump, Figure 1 (4), and Figure 4, the valves are manipulated so that the final pressure attained in the cycle is conserved in bomb, Figure 1 (3), and cylinder, Figure 1 (2, *a*), while gas from the sample containers is allowed to force the mercury from cylinder, Figure 1 (2, *b*), back through a by-pass around the mercury pump into the mercury reservoir. By repetition of this cycle a suitable number of times, any desired pressure in the bomb may be obtained up to the limit of the pump. The length of time required is excessive, however, since the pump displacement is but 18 cc. per minute up to 10,000 pounds per square inch. In order to attain greater pumping speed, the oil pump, Figure 1 (5) and Figure 5, rated at 300 cc. per minute up to 2,000 pounds per square inch. In order to attain greater pumping speed, the oil pump, Figure 1 (5) and Figure 5, rated at 300 cc. per minute up to 2,000 pounds per square inch, is used to force oil into the top of auxiliary 3,500-cc. cylinder, Figure 1 (6). Mercury is thereby forced from the bottom into cylinder 2, *a*, or 2, *b*, thus compressing the gas as before. Cylinder, Figure 1 (6), is provided with a look-glass made by coupling three Jerguson gauges, through the aid of which the progress of the mercury in cylinder, Figure 1 (2, *a* or *b*), can be gauged by noting the position of the mercury-oil interface. At the end of a pumping cycle the sample gas pressure is again utilized to force the mercury back into cylinder, Figure 1 (6), and consequently the oil from cylinder, Figure 1 (6), back into the oil pump reservoir. A complete pumping and blowing-back cycle requires but 12 minutes.

An accurately calibrated small steel cylinder, not shown in the diagrams, provided with valves at both ends, is connected into the line communicating with the top of the bomb, Figure 1 (3), and the dead-weight gauge, Figure 1 (7)

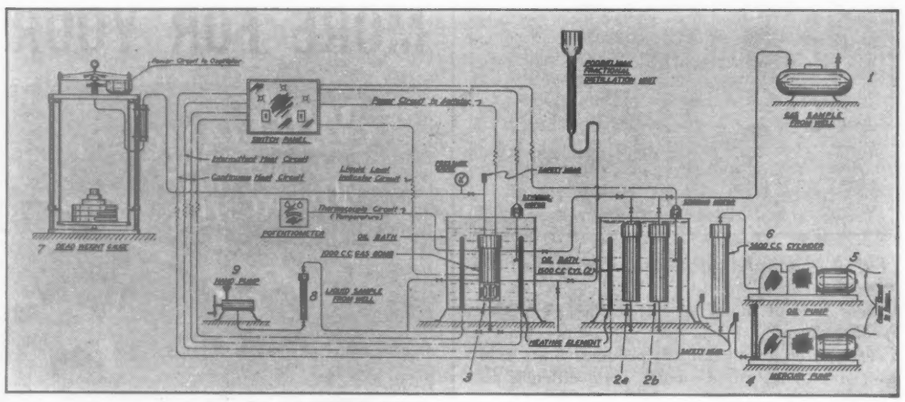


Fig. 1—Flow diagram of high-pressure apparatus for determining phase relations of reservoir conditions

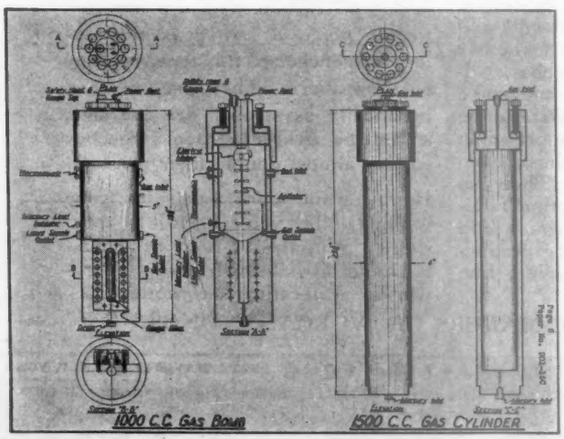


Fig. 2—Details of high-pressure gas cylinder and bomb used in determining phase relations of reservoir conditions

W. F. FULTON

A. P. I.

Paper presented before meeting Southwestern District, Division of Production at San Antonio, Tex., March 16-17, 1939.

Author's title: "Laboratory Technique and Equipment For the Study of Condensate"

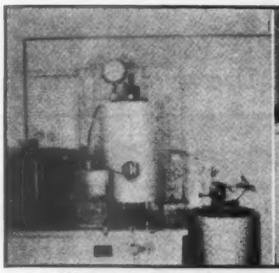


Fig. 3—Main reaction bomb in oil bath

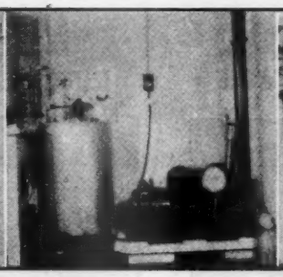


Fig. 4—Mercury pump and storage cylinder

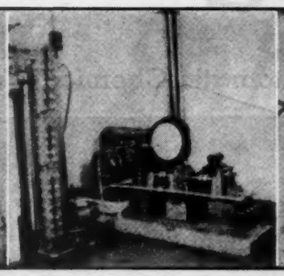


Fig. 5—Oil pump up to 2,000 pounds

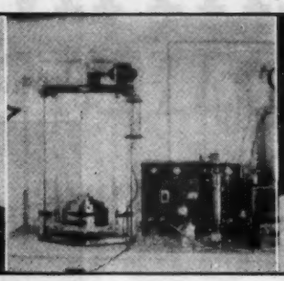


Fig. 6—Dead-weight gauge and electric-control panel

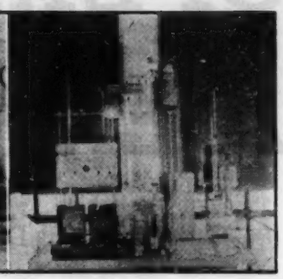


Fig. 7—Low temperature fractionating apparatus for gas analysis

and Figure 6; this cylinder is maintained at the reservoir temperature by the oil bath. By bleeding the gas out of this cylinder, initially containing gas at reservoir conditions, and determining its volume at room temperature and atmospheric pressure by means of a wet test meter, it is possible to calculate the compressibility factor, that is the deviation of the gas from the ideal gas laws at reservoir conditions. Then knowing the volume of the experimental re-combination bomb, Figure 1 (3), the pressure and temperature of the gas contained therein, it is possible to calculate the absolute amount of the gas and thence to determine from the gas-liquid ratio measured at the well the volume of liquid sample to be introduced in the bomb. In order to correct the gas-liquid ratio for non-ideality of the gas flowing through the orifice meter, a determination is made of the compressibility factor of the gas at approximately separator conditions, that is room temperature and 500 pounds per square inch, the lowest pressure recordable on the dead-weight gauge, Figure 1 (7), and Figure 6. The dead-weight gauge has a capacity of 10,000 pounds per square inch, with an absolute precision of at least ± 5 pounds per square inch.

The liquid sample cylinder, Figure 1 (8), usually for purposes of convenience contains about 25 cc. of separator liquid. The line from cylinder, Figure 1 (8), to the bomb is initially full of mercury. Predetermined quantities of liquid can be forced into the recombination bomb, Figure 1 (3), from cylinder, Figure 1 (8), by means of the hand mercury pump, Figure 1 (9), the displacement of which is calibrated to 0.01 cc. In some cases a vapor space is intentionally or unavoidably present in the liquid sample cylinder; if the liquid were forced into the bomb in this case without preliminary treatment, the results would possibly be vitiated by nonuniformity of the liquid sample. Accordingly the sample cylinder is cooled in the ice box for some time, and mercury is forced into the cylinder by means of mercury pump, Figure 1 (9), until the rapid increase of pressure detectable by the tightening of the pump indicates that the sample exists solely in the liquid phase. The bottom valve of the cylinder is then closed and the cylinder is removed and shaken thoroughly to produce uniformity throughout the liquid. The small amount of mercury which was forced into the cylinder serves admirably as a source of internal agitation because of the large density difference between the two liquids. The liquid sample cylinder is replaced in the line and the calculated amount of liquid is forced into the bomb, Figure 1 (3), by means of pump, Figure 1 (9). In this calculation one must take proper account of the temperature of the liquid sample and the fact that the liquid is being measured in at reservoir pressure, whereas the gas-liquid ratio in the field is given in terms of the separator liquid (or stock-tank liquid) at 60° F. and at separator (or atmospheric) pressure. Thus correction must be made for the thermal expansion and compressibility of the liquid. In the case of the gas-liquid ratio based on stock-tank liquid at atmospheric pressure an additional correction must be applied to account for the volume shrinkage taking place upon the flash vaporization of the liquid from separator to atmospheric pressure. In general it seems more reliable to calculate this shrinkage from the molal analysis of the separator liquid, making use of the published equilibrium constants of Katz and Hachmuth,[1] than to determine it experimentally.

The construction of the experimental recombination bomb is shown in detail in Figure 2. The use of a transparent Bakelite follower in conjunction with the glass window has proven more successful than that of the steel follower shown in the diagram. The bomb is provided with an internal stirring motor directly connected to the agitator. The agitator actually at present extends down into the constricted lower portion of the bomb. As liquid vaporizes mercury can be injected at the bottom in order to bring the remainder of the liquid under the influence of the high-speed agitator. The process of the determination can be observed through the window and the point of attainment of equilibrium can be decided upon visually. Liquid samples can be removed for analysis by raising the mercury level until it makes electrical contact with the level indicator, and then withdrawing liquid by means of the hand mercury pump, Figure 1 (9), into a sample cylinder initially filled with mercury. Samples of the gas phase can be withdrawn through the gas sample outlet and conveyed to the Podbielniak apparatus for analysis. During gas sampling the pressure can be maintained constant by injection of mercury into the bottom of the bomb at a proper rate. The gas sample line to the analytical apparatus is lagged with asbestos and electrically maintained at a temperature higher than bottom-hole to prevent condensation of liquid.

Making use of the amount of gas initially present in the bomb and the calculated density, molecular weight and the volume of separator liquid introduced, the analyses of gas and liquid may be combined on a molal basis and compared with the analysis of the sample of the equilibrium gas phase from the bomb.

All pieces of high-pressure apparatus were cold-tested to 10,000 pounds per square inch, including the liquid sample cylinders. The high-pressure connections consist of cold-drawn molybdenum steel tubing, of inside diameter one-sixteenth and outside diameter one-fourth inch. Special high-pressure unions are used throughout the assembly of the high-pressure apparatus. [This is understood to refer to all portions of the apparatus save the oil pump, Figure 1 (5), and the auxiliary 3,500-cc. pumping cylinder, Figure 1 (6).]

[1]Katz and Hachmuth, Ind. Eng. Chem., 29, 1072 1937).

Hortonsphere designed to withstand working pressure of 100 pounds per square inch. In Atlantic refinery at Atreco, Texas

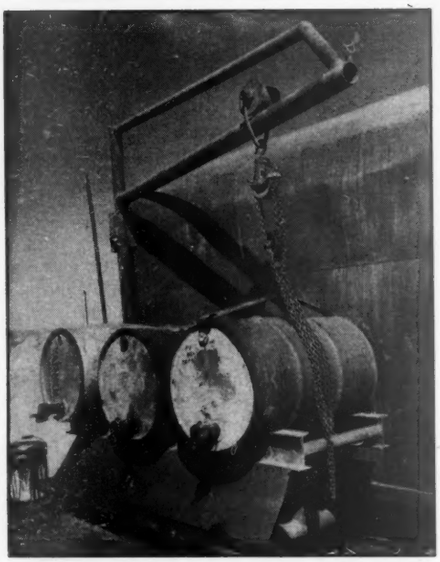
Encyclopedia for Gas Forms Made Available to Industry

The second edition of Benoit's Cyclopedia of Oil and Gas Forms has been recently prepared by Curtis M. Oakes, of Tulsa. In the revised edition all forms which have become obsolete or obsolescent have been dropped and there has been substituted the latest approved and current forms now being used by the industry throughout all the recognized oil and gas states. Many original forms which by their nature (being in the main contractual) do not become obsolete have been retained, and many new forms which have come into general use since the publication of the original work have been added. Special attention has been given to the new oil fields in Illinois and Kentucky, which it is thought will be great benefit to the operators in those states. Forms used in Missouri are also included.

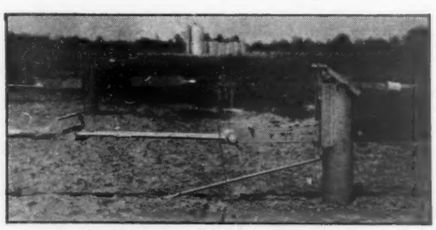
The second edition of Benoit's Cyclopedia of Oil and Gas Forms may be purchased through the Book Department of The Oil and Gas Journal at the regular established price of $10, express prepaid (postage extra outside the United States). Where payment does not accompany order, the book will be sent express c.o.d. to avoid delay.

OPERATING IDEAS

Crane for Oil Drums



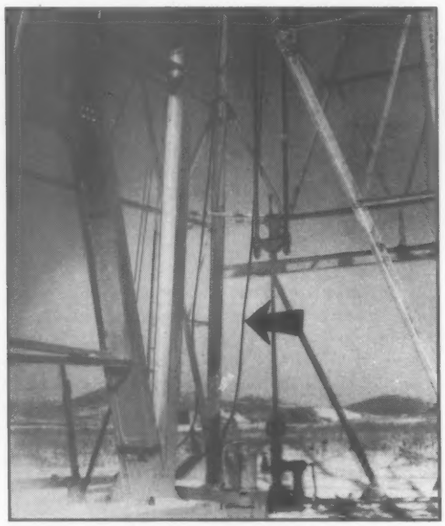
At one heavy rotary rig in the Sand Hills field, Crane County, Texas, the drum rack and gantry-crane shown here have been devised for handling drums of lubricating oil. The crane and rack are mounted on the dog house sled, with a tool box placed on the other side, thus reducing the number of pieces of equipment that have to be moved from location to location. Drums are moved directly from trucks to the rack by means of the crane and chain hoist. A hook, made from pieces of flat iron, fit over the edges of the drum and, when the drum's weight is placed on the hoist, holds the drum securely. The rack is fashioned from I-beams, with welded cross members and cut out to prevent the drums from rolling. A piece of 8-inch pipe was split for use as a drain with an old piece of flat iron insuring drainage.



Safe Knock-Off Block

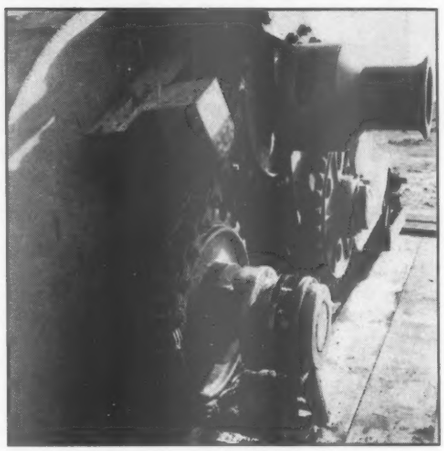
The installation is north of Centralia, Ill. It is only necessary to trip the lever on the upright post when the pull rod is at the end of the stroke. This automatically drops the U-bolt and disconnects the pump.

Automatic Chemical Feed

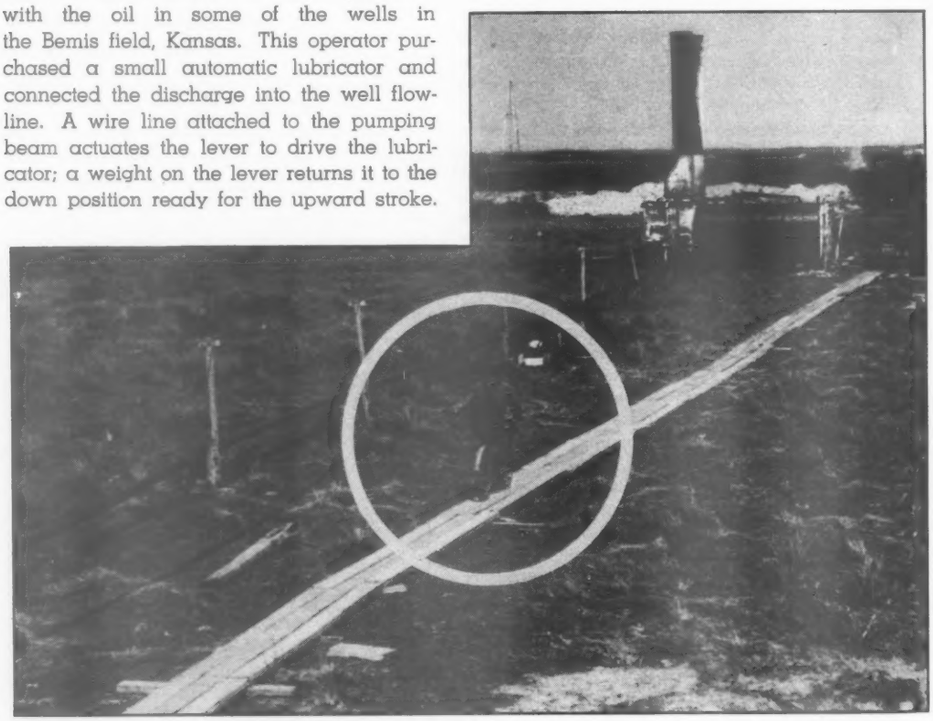


A small amount of chemical treatment aids in the removal of brine produced with the oil in some of the wells in the Bemis field, Kansas. This operator purchased a small automatic lubricator and connected the discharge into the well flowline. A wire line attached to the pumping beam actuates the lever to drive the lubricator; a weight on the lever returns it to the down position ready for the upward stroke.

Idler on Drawworks Chain



Discarded piston rubbers have been used by a drilling contractor to make an idler for the drawworks chain which eliminates slapping and excessive wear on the chain.



Fireman Rides Bicycle from Derrick to Boilers

Operators often locate super-heat boilers at a considerable distance from the derrick floor for a variety of reasons. Near Athens, Tex., one setting of super-heat steam generators is being used to drill four successive surrounding locations. This means that the fireman must walk (or run) a city block between the boilers and derrick floor several times during a "trip" to check the water level in the boilers. Besides being hard on the fireman, who has to leave his post at the cat-head to make these journeys, it slows down the drilling crew as the driller must do the cat-heading while the fireman is inspecting the boilers. To cut down time for going back and forth to the boilers, this fireman purchased a bicycle and laid a three-board walk on which to ride. When he thinks the water in the boiler might be getting too high or too low he jumps on his bicycle and makes a quick tour of inspection. If no adjustment is needed on the boiler he can make the journey while the driller is lowering the pipe and be back at his post in plenty of time to spin the next stand.

Action of Inhibitors on Polymer Gasoline

By W. B. ROSS and L. M. HENDERSON
The Pure Oil Co.

W.P.R.A.—Delivered before annual meeting of Western Petroleum Refiners Association in San Antonio, March 20-22.

Polymer gasoline manufactured from gaseous hydrocarbons possesses many desirable qualities, most notable of which is its high octane blending value. Other factors should, however, be considered. That much interest has been taken in liquid fuels produced by polymerizing gaseous hydrocarbons is evidenced by the number of papers which have appeared on the subject in the technical literature of recent years. Frey and Hepp cite some 75 articles and patents in their resume of "Thermal Reactions of Gaseous Hydrocarbons," appearing in Volume 3 of "The Science of Petroleum" published in 1938. In the same book Howes contributed three articles on topics related to the pyrolysis of gaseous hydrocarbons in which he cites a total of 256 references. There are many duplications in these bibliographies, but many single items contain two to seven or eight patents or papers so that the total number of patents and publications undoubtedly runs into the hundreds. Very little has been

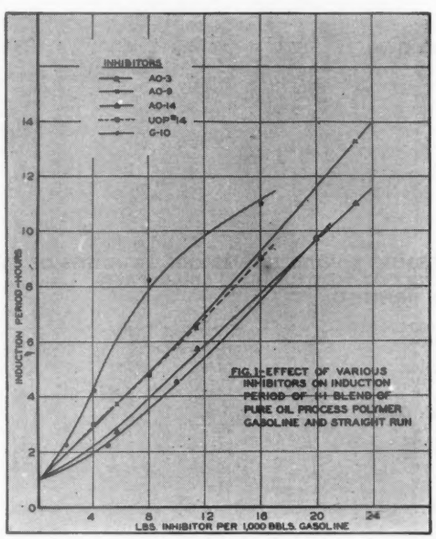


FIG. 1—EFFECT OF VARIOUS INHIBITORS ON INDUCTION PERIOD OF 1:1 BLEND OF PURE OIL PROCESS POLYMER GASOLINE AND STRAIGHT RUN

heretofore reported on the effectiveness of inhibitors in poly gasoline. Howes[1] states "200° C. endpoint distillate from crude polymer spirit may be stabilized against gum formation to an extent satisfactory for normal conditions by the addition of inhibitors." Carey[2] in discussing polymer gasoline states that "by the use of an inhibitor such as BAP in the amount of approximately 0.01 pound per barrel, an extremely gum stable product having a high induction period is obtained."

As a consequence of the method of manufacture, polymer gasoline is more or less susceptible to atmospheric oxidation even as is ordinary gasoline. Data are presented below which show that the addition of small amounts of commercially available antioxidants to Gray treated poly distillates inhibits gum formation even as they do in conventionally cracked gasolines. Inasmuch as the data available in the literature is so meager, the experimental results reported in this paper represents data kindly furnished privately by Dr. Gustav Egloff relative to the use of U.O.P. inhibitors in gasoline produced by the U.O.P. catalytic polymerization process, or from the work of the Pure Oil Co. on their polymerized gasoline. These data show that the stabilization of gasoline toward gum formation is easily and satisfactorily accomplished by the addition of inhibitors.

Experimental Data

Plant experience and laboratory tests have shown that the storage stability of a cracked gasoline may be qualitatively indicated by the "induction period" of a sample. The so-called "induction period" is commonly determined in the laboratory by subjecting the gasoline in a steel bomb to oxygen gas at an elevated pressure (usually 100 pounds gauge) and at a temperature of 212° F. Other methods of determining induction periods have been used whereby oxygen at lower pressures is employed in a glass vessel at 212° F.[3] The copper dish gum test is also used by some refiners in addition to the induction period to provide supplementary information relative to the gum stability of the gasoline. The induction periods reported in this paper were determined in a steel bomb of the Ethyl Gasoline Corp. type and charged with oxy-

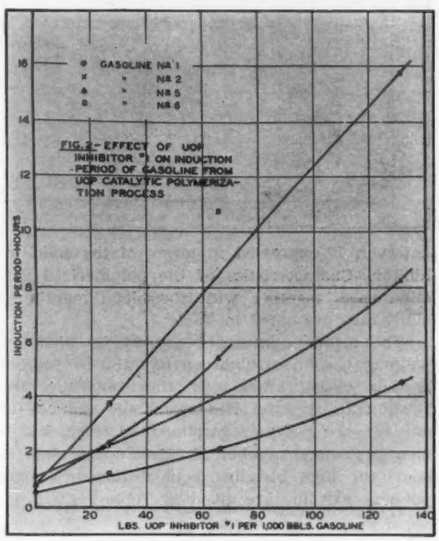


FIG. 2—EFFECT OF UOP INHIBITOR #1 ON INDUCTION PERIOD OF GASOLINE FROM UOP CATALYTIC POLYMERIZATION PROCESS

gen at 70° F. to 100-pound gauge and heated at 212° F. until a definite drop or "break" in the pressure occurred. The time elapsed from the introduction of the bomb in the 212° F. heating bath to the break in the pressure curve is defined as the "induction period." The copper dish gums were determined according to the methods described in Bureau of Mines Reports of Investigations No. 3152, November, 1931, and in Federal Specifications VV-L-791a, Method 330.1.

The induction periods and copper dish gum

TABLE 1—INDUCTION PERIODS OF BLEND CONTAINING EQUAL PARTS OF PURE OIL POLYMERIZED GASOLINE AND STRAIGHTRUN GASOLINE CONTAINING VARIOUS CONCENTRATIONS OF COMMERCIAL ANTIOXIDANTS

Inhibitor:	None	AO-3	AO-9	AO-14	U.O.P.-4	G-10 solid
Pounds inhibitor per 1,000 bbls. (42s)—	Induction period in hours					
0.0	1	..	..	..	..	2¼
2.0	..	..	..	..	3	4¼
4.0	..	2¼	..	..	..	..
5.0	..	..	3¾	2¾	..	..
5.71	..	..	..	..	4¾	8¼
8.0	..	4¼	..	..	..	..
10.0	..	..	6½	5¾	..	..
11.42	..	..	..	..	9	11
16.0	..	9¾	..	..	..	..
20.0	..	..	13¼	11	..	..
22.84	..	18½	..	..	..	..
40.0	..	..	..	..	..	..
Copper Dish Gum						
0.0	33	..	..	..	..	..
2.0	..	..	..	..	13	22
4.0	..	..	..	..	13	21
5.0	..	17	..	..	..	..
5.71	..	..	11	9	..	..
8.0	..	12	..	..	11	18
10.0	..	..	10	10	..	..
11.42	..	..	..	..	9	15
16.0	..	8	..	..	..	..
20.0	..	..	11	10	..	..
22.84	..	..	..	..	9	..
32.0	..	14	..	..	..	..
40.0	..	..	11	11	..	..
45.7	..	..	..	..	..	..

contents of a blend of polymerized gasoline and straight run gasoline containing various amounts of commercial antioxidants are shown in Table 1. Figure 1 contains the same data in graphical form. With the exception of G-10, the inhibitors herein discussed are solutions and the quantities used in the respective gasolines are expressed in pounds of the commercial inhibitor solutions per thousand barrels (42s) of gasoline. The G-10,

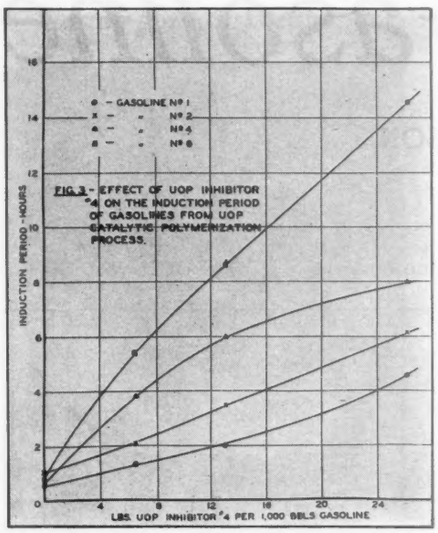


FIG. 3 - EFFECT OF UOP INHIBITOR #4 ON THE INDUCTION PERIOD OF GASOLINES FROM UOP CATALYTIC POLYMERIZATION PROCESS.

however, is expressed in terms of the solid inhibitor. Characteristics of the polymerized gasoline used, together with the blend mentioned above, are presented in Table 2.

The octane number of the 50 : 50 blend of polymer gasoline-straightrun naphtha in Table 2 appears to be rather low. However, since the straightrun naphtha had an octane number of only 24, the polymer gasoline, therefore, had a blending octane number of 101. Further data to show the high blending octane number of the polymer gasoline are given in Table 2a.

TABLE 2a

Blend—	Per cent 400 E.P. poly gasoline	Per cent A-5 gasoline	L-3 octane number	Blending octane number
A	100		81.2	
B	50	50	72.4	105
C	25	75	60.0	120
D	10	90	49.8	138
E	..	100	40.5	..

Table 3 includes the same data as Table 1 with the exception that an ordinary unleaded doctor-treated Mid-Continent gasoline was used instead

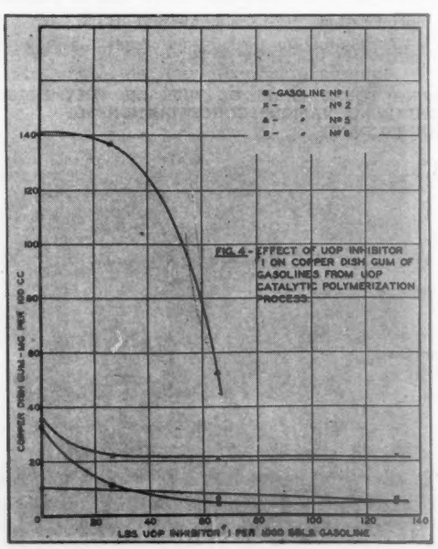


FIG. 4 - EFFECT OF UOP INHIBITOR #1 ON COPPER DISH GUM OF GASOLINES FROM UOP CATALYTIC POLYMERIZATION PROCESS.

of the polymerized gasoline-straightrun gasoline blend of Table 1. A comparison of the data of the two tables shows that the susceptibility of a polymerized gasoline blend to inhibitors is of the same general order as that for ordinary cracked gasoline.

No data on susceptibility of gasolines to inhibitors would be complete without determining the effect of tetraethyl lead upon these values. Table 4 shows the effect of TEL upon a polymerized gasoline-straightrun naphtha blend containing various inhibitors. As will be seen from these values the effect of TEL is almost within the experimental error of the determinations.

Table 5 presents data furnished us by Dr. Gustav Egloff and shows the effects of two inhibitors on six samples of polymer gasolines from the U.O.P. catalytic process. The results are shown graphically in Figures 2, 3, and 4. As will be seen, the susceptibilities of these polymer gasolines to inhibitors is of the same order as the susceptibilities of the Pure Oil polymer gasoline to inhibitors. Table 6 gives the characteristics of the above-mentioned six samples of polymer gasolines from the U.O.P. catalytic process.

From the data presented on the use of gasoline antioxidants in polymer gasolines produced both by thermal and catalytic processes of manufacture, it is evident that polymer gasolines may be satisfactorily stabilized with respect to gum formation by means of commercially available inhibitors.

Literature Cited

1. The Science of Petroleum, Vol. 3, p. 2069.
2. National Petroleum News, 28, No. 45, 64-71.
3. Rogers, Bussies and Ward, Ind. & Eng. Chem., 25, 401 (1933).

TABLE 2—TESTS ON POLYMER GASOLINE AND BLEND

Sample—	Grav.	I.B.P.	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	E.P.	% rec.	% res.	% loss
Gray treated polymer distillate	56.1	90	115	126	144	157	168	179	192	212	243	317	...	406	94.4	1.2	4.4
50 per cent Gray treated polymer distillate, 50 per cent straightrun naphtha	58.3	106	145	163	184	200	214	226	237	250	261	282	320	364	96.8	1.2	2.0

Sample—	Reid vapor pressure	A.S.T.M. octane No.	A.S.T.M. gum	Copper dish gum	Per cent unsaturates	Per cent aromatic
Gray treated polymer distillate	14.3	80.0	4	100	29	30
50 per cent Gray treated poly distillate, 50 per cent straightrun naphtha	8.2	62.7	1	33	14	16.7
100 per cent straightrun naphtha		24.0	..	..	..	..

TABLE 3—INDUCTION PERIODS OF AN ORDINARY UNLEADED DOCTOR-TREATED MID-CONTINENT GASOLINE (COMPOSED APPROXIMATELY OF 40 PER CENT STRAIGHTRUN GASOLINE, 20 PER CENT CHP GASOLINE, 25 PERCENT CROSS CRACKED GASOLINE AND 15 PER CENT CASINGHEAD GASOLINE) CONTAINING VARIOUS CONCENTRATIONS OF COMMERCIAL ANTIOXIDANTS

Inhibitor: Pounds inhibitor per 1,000 bbls. (42s)—	None	AO-3	AO-9	AO-14	U.O.P.-4	G-10 (solid)
	Induction period in hours					
0.0	2¾	..	..	..	..	..
2.0	..	..	..	..	3¾	3¼
4.0	..	..	..	..	4¼	3¾
5.0	..	4	..	..	..	..
5.71	..	..	4½	4¼	..	..
8.0	..	..	..	..	6	5
10.0	..	5	..	..	..	..
11.42	..	..	6½	5½	..	..
16.0	..	..	..	..	..	..
20.0	..	7½	..	..	..	..
22.84	..	..	9½	8¼	..	..
40.0	..	..	..	..	..	..
	Copper Dish Gums					
0.0	81	..	..	..	..	..
2.0	..	..	..	..	42	32
4.0	..	..	..	..	13	18
5.0	..	12	..	..	..	..
5.71	..	..	12	17	..	..
8.0	..	..	..	..	13	16
10.0	..	12	..	..	..	..
11.42	..	..	15	16	..	..
16.0	..	..	..	..	..	..
20.0	..	19	..	..	..	..
22.84	..	..	10	11	..	..
32.0	..	..	..	..	..	..
40.0	..	..	..	..	..	..
45.7	..	..	..	..	..	..

TABLE 4—INDUCTION PERIODS OF INHIBITED POLY GASOLINE CONTAINING VARYING QUANTITIES OF TEL (THE GASOLINE CONSISTED OF 50 PARTS PURE OIL POLY GASOLINE AND 50 PARTS STRAIGHTRUN NAPHTHA)

TEL, cc./gal.: Inhibitor—	Lb./1,000 bbls.	0	1	3	5
		Induction period in hours			
AO-3	10.0	5¼	5¾	6	5
AO-9	11.42	6¾	6½	7	6¾
AO-14	11.42	4	4½	4	5¼
U.O.P.-4	8.0	5½	6¼	..	..
G-10 (solid)	4.0	4¼	4½	4¼	4¼
		Copper Dish Gums			
AO-3	10.0	13	13	20	15
AO-9	11.42	..	7	..	33
AO-14	11.42	..	12	..	35
U.O.P.-4	8.0	..	10	..	35
G-10 (solid)	4.0	..	17	..	56

The gasoline used in Table 4 was comparable with but not identical with the Pure Oil poly gasoline-straightrun blends used in previous tables.

TABLE 5—EFFECT OF U.O.P. INHIBITORS NO. 1 AND NO. 4 ON U.O.P. CATALYTIC POLYMER GASOLINE

Gasoline number:			1	2	3	4	5	6	1	2	3	4	5	6
	Quant. wt. per cent	Inhib. lbs./ 1,000 bbls.*	Induction period—hours						Copper dish gum					
	None	None	0.58	1.08	1.08	0.67	0.83	0.83	10	36	10	19	141	33
U.O.P.-1	0.01	26.2	1.25	2.17	..	...	2.34	3.76	11	22	..	..	137	11
	0.025	65.5	2.09	4.0	4.25	...	5.42	10.77	6	21	8	..	53	4
	0.05	131.0	4.5	8.25	...	...	...	15.70	5	22	..	..	...	6
U.O.P.-4	0.0025	6.55	1.33	2.09	...	3.84	...	5.42	5	14	..	11	...	5
	0.005	13.1	2.0	3.5	6.0	6.0	...	8.6	5	12	5	11	...	4
	0.010	26.2	4.58	6.1	...	8.0	...	14.6	4	12	..	11	...	3

*Calculated for gasoline with specific gravity of 0.75 and 42-gallon barrels.

TABLE 6—TESTS ON POLYMER GASOLINES, U.O.P. CATALYTIC PROCESS

Sample No.:	1	2	3	4	5	6
°A.P.I. gravity at 60° F.	68.8	66.3	69.6	70.0	63.4	67.0
I.B.P.	89	106	85	88	93	91
10	136	149	115	117	137	140
50	207	214	207	205	242	216
90	343	326	312	300	370	331
E.P.	383	433	388	393	475	420
R.v.p., lbs./sq. in.	15.0	11.8	11.6	13.7	10.4	10.1
Octane number (M.M.)	81.0	80.5	81.0	83.0	80.5	82.0

QUESTIONS ON TECHNOLOGY

By Charles K. Francis, Ph. D., Technical Editor

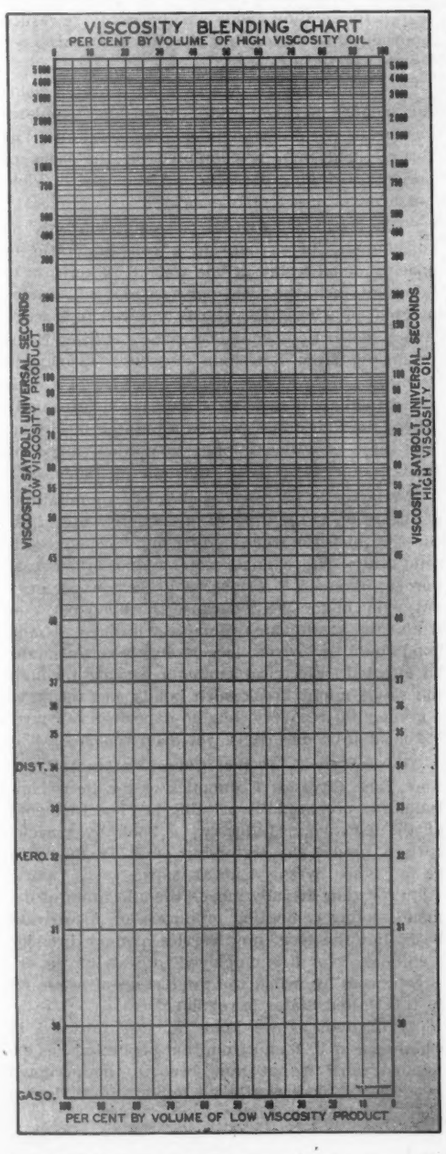
Chart For Estimating Viscosity of Petroleum Oil Blends

Can you refer us to a formula or chart adapted for calculating the quantities of fuel oil and distillate, or other oils, to make an oil of any desired viscosity?—E. N.

The viscosity blending chart has been shown several times in The Oil and Gas Journal. This chart was first prepared under the direction of C. M. Larson.

Example A.—Estimate the viscosity of a blend of 15 per cent 38 viscosity oil and 85 per cent 153 viscosity oil. Place a straight edge between 38 (left) and 153 (right). This crosses the 85 per cent (heavy) line and 15 per cent (light) line at the 105 seconds line. The estimated viscosity is 105.

Example B.—Knowing the viscosity of the original motor oil, the percentage dilution may be found by placing a line between the motor oil viscosity (right) and the fuel used (left). The intersection of this line with the viscosity line of the used oil shows the percentage dilution.


VISCOSITY BLENDING CHART
PER CENT BY VOLUME OF HIGH VISCOSITY OIL
VISCOSITY, SAYBOLT UNIVERSAL SECONDS LOW VISCOSITY PRODUCT
VISCOSITY, SAYBOLT UNIVERSAL SECONDS HIGH VISCOSITY OIL
DIST.
KERO.
GASO.
PER CENT BY VOLUME OF LOW VISCOSITY PRODUCT

Reference: C. M. Larson, The Oil and Gas Journal, November 24, 1932, Page 37.

Laboratory Apparatus and Method For Hydrogenation Investigations

Will you kindly give a description of the apparatus and method for making hydrogenation experiments with petroleum oils? What is wanted is small scale apparatus.—P. D. P.

Several laboratory scale hydrogenation plants have been described in the literature. A recent article by Mair, Willingham and Streiff, of the National Bureau of Standards, contains a description of apparatus and the laboratory method of investigating hydrogenation as applied to petroleum oils. The apparatus includes a bomb and liner, thermocouple well, heating and shaking devices, gauges, hydrogen in cylinders, and a specially prepared catalyst. The apparatus has been fully described by Adkins. The volume capacity of the bomb was 500 ml. and that of the copper liner 350 ml.

After a series of trials this procedure was adopted: The oil fraction of 12 to 30 grams was dissolved in 75 ml. of methylcyclohexane and transferred to the liner. About 40 to 50 grams of Raney nickel which was stored under water, was transferred to a sintered glass filter and most of the water drawn off by suction. It was then washed with alcohol and finally with methylcyclohexane, and transferred while still wet to the liner, which was previously filled with carbon dioxide. Raney nickel is a product developed by Murray Raney, obtained from the Gilman Paint & Varnish Co., Chattanooga, Tenn. This catalyst is prepared from finely ground nickel-aluminum alloy by dissolving the aluminum with sodium hydroxide solution.

After each hydrogenation treatment, 10 to 12 hours at 230° to 250° C., oil and solvent were separated from the catalyst in a sintered glass filter, and the catalyst washed with methylcyclohexane. The refractive index and refractive dispersion were determined on a small portion of the oil from which the solvent had been removed by heating in a vacuum. After removal by distillation of the extra solvent used in washing, the oil was ready for the next treatment with a fresh portion of catalyst. After the final treatment, the solvent was removed from the oil by distillation and finally by sweeping out at 110° C. at 25 mm. pressure with carbon dioxide.

The loss of oil in a complete hydrogenation was 10 to 20 per cent, part of which was due to portions adhering to the walls of the vessel in which the sample was freed from solvent. The oil was water-white in color after the first treatment.

References: Mair, Willingham, and Streiff, Hydrgenation of the "Extract" Portion of the Lubricating Fraction From a Mid-Continent Petroleum, Jour. Research of the National Bureau of Standards, 21,565, 1938. Homer Adkins, Reactions of Hydrogen, Univ. Wisconsin Press, 1937.

Helium Is Inert Gas Without Odor

Will you kindly give me some information about helium? I have some gas with a strong odor that might be helium.—A. N.

Helium is one of the rare gases which neither burns nor supports combustion. It is valued for filling airships because of its weight, only 0.1381 compared with air, and the fact that the hazard of explosions and fires is eliminated. It is tasteless and odorless. No compounds of helium are known, although it is found in several minerals. Small quantities are present in the atmosphere, 1 to 2 parts in a million. The important source of helium is natural gas where it occurs from a trace to around 16 per cent. The natural gas now producing helium contains approximately 2 per cent.

PROPERTIES OF HELIUM

Specific gravity:	
Air =	0.1381
Hydrogen =	1.9800
Atomic weight	4.0020
Critical temperature, °C.	—267.94
Critical pressure, atm.	2.26
Boiling point, °C.	—268.91
Freezing point, °C.	—271.9
Specific heat, cal./g.	1.26
Density, lbs./cu. ft. 0°-760°	0.0115

Helium is extracted from natural gas by the application of very low temperature under pressure. Helium being the most difficult gas to liquify, the other associated elements are withdrawn in liquid form leaving the residue essentially helium. The cost for producing helium is about $9 per 1,000 cu. ft.

References: R. R. Bottoms, Occurrence and Production of Helium in the United States, Science of Petroleum, Vol. 2, 1517. C. W. Seibel and H. S. Kennedy, Helium Minerals Yearbook 1938, U. S. Bureau of Mines, Page 973.

Questions on Petroleum Technology may be sent to Dr. Charles K. Francis, The Oil and Gas Journal, Tulsa, Okla. When a copy of the answer is desired, postage should be included.

INDEX

CHEMICALS FOR THE PETROLEUM INDUSTRY

Specifications which have appeared in

THE OIL AND GAS JOURNAL

with

Questions on Technology

by

Charles K. Francis, Ph.D.

Note—A portion of this index will appear each week until completed.

PROBLEMS FROM READERS

Edited by L. G. E. Bignell

Changes in Oil Industry Brought About Through Proration

Much has been written about proration and its effect upon the oil industry but I would like to know if you can refer me to any specific articles on this subject.—N. S. H.

As you state there has been a lot written about proration and a series of articles have appeared in The Oil and Gas Journal prepared by Earl Oliver, Joseph E. Pogue and others. The mineral section of the American Bar Association has recently published a book on the history of Oil and Gas Conservations Laws prepared by attorneys recognized as authorities on this subject in 11 oil states.

In a recent informal address before the School of Engineering, University of Texas, Austin, Tex., J. Elmer Thomas of Fort Worth said in part:

"The simplest form of sharing a pipe line outlet was first applied to limit each well to a certain number of barrels per day. But some wells sooner or later were unable to produce their allowables, while others were capable of many times the fixed amount, and the injustices of such a procedure quickly became apparent. The next step was to permit each well to produce a stated fraction or percentage of its maximum capability, but this was subject to several very valid objections. A well's "potential," or maximum capacity usually showed a steadily declining tendency and even between wells in the same pool and in the same pay horizon the rate of decline of potentials varied considerably. This led to the necessity of taking frequent and troublesome, and often inaccurate, gauges for periodic redeterminations of the wells' respective potentials.

"It also led to intensive drilling of the most prolific portions of a pool and to increased extraction from the more porous areas, which tended to cause too rapid separation of gas from the oil as well as coning of bottom-hole water. Also there are different ways of taking potential gauges for the various individual pools and no ready method of assigning appropriate allowables to the wells in the several pools gauged by different methods. Furthermore, there are certain methods for stimulating a well's actual maximum capacity during a short-time gauge and unless all wells could and would use similar devices there was no equitable basis for allocations. Taken alone, the straight potential method is bad equity, bad engineering and bad economics.

"Dissatisfaction over producing all wells at a flat rate was succeeded by dissatisfaction over producing them at a fixed percentage of initial or potential capacity because, it was pointed out, a well's early or maximum gauge is not directly porportional to its ultimate yield, under free and untrammeled operation, and hence regulating allowables to such gauges magnified and perpetuated the inequities of such a basis. The true ratio of ultimate production, unregulated, is believed to be to the square root or possibly the cube root of initial capacity, and in some cases perhaps an even higher power is valid.

"Another inequity of the potential method of per well allocation is due to its taking no account of the acreage in the lease supporting that well. If an operator has a 10-acre lease with one producing well on it and another operator has an 80-acre lease with one producing well on it, and each one is assigned the same per well allowable, the 10-acre well is certainly going to drain some oil from the 80-acre well and the operator of the latter can only protect himself by drilling seven additional oil wells on his tract. To prevent the necessity of such unnecessary and unjustified activity in times of overproduction, an acreage factor was combined with the potential factor in computing allowables. This was a step forward but there is some doubt if sufficient weight ever has been given to the acreage factor. Properly weighted, much unnecessary drilling could have been avoided.

"It is thus evident that these progressive steps, this gradual improvement in proration methods to obtain full equity, have tended quite definitely in the direction of giving better consideration to the ultimate supply of oil back of each well, each lease and each operator. Thus it is in the last analysis the reserve that should receive proper attention. In any given pool if each well were operated to exhaustion under a program such that each well, each lease and each operator had produced precisely the same amount ultimately as would have resulted from free and untrammeled operation, then only the time element would have been changed by the exigencies of proration and full equity would have been done to all. It is usually possible to estimate reserves with a fair degree of accuracy, although it is not equally simple to write proration formulas for an early period that will effect an ultimate extraction with that final result, but more attention should be paid to reserves as a basis for allocations.

"What is fair and reasonable as between the several wells, leases and operators in a single pool offers likewise a fair and reasonable basis for determining the outlet of the competing pools within any given states, as well as furnishing a basis for sharing the market as between the several producing states. These improvements may be slow of attainment but they must come. Changes will be gradual, with attention being given to relative costs of production, to geographical locations and to established trade channels. Perfecting a system both necessary and beneficial is well worth the effort involved and the effort will be made."

In his new book, "Fundamentals of the Petroleum Industry," Dorsey Hager has this to say about the purposes of proration:

"The purposes of proration are: to maintain gas and water pressures in the oil fields in order that wells may flow their production as long as possible; to restrict production to the actual demands of the market; and to eliminate the wastage of natural gas from oil fields. There is no longer any basis for local gluts, as each state is now allocated a definite number of barrels daily, based on figures compiled monthly by the U. S. Bureau of Mines. Within the states each field is allocated a definite production, and within each oil field the various producing properties are allotted a definite allowable amount per well or lease. Wells are brought in under control, and allowable production is set for each leaseholder in proportion to acreage, sand thicknesses, and the number of producing wells.

"As a result, operating practices have changed greatly. Wells in new fields are now induced, if possible to flow their production, not as large gushers, but as small wells under high pressures. The natural gas in the oil sands is maintained as an expulsive agent, and the natural water drive in most fields assists in washing the oil from the sands and maintains a constant pressure on the oil. In many fields heavy hydrostatic head surrounds the fields. As the gas and oil is withdrawn, water not only fills the space left by the gas and oil but also exerts a driving force that washes the gas and oil toward the well. If the gas and oil are withdrawn too rapidly, water may force in ahead and form a cone around the well, shutting off the gas and oil.

"With controlled development and with a 'backlog' of known oil reserves, the industry can proceed with surer steps. The pioneers who search for new oil fields will be richly rewarded for their discoveries, but the old hit-or-miss system is practically dead.

"In computing recoveries from prorated fields the balance between water drive and expulsive gas pressures must be taken into account. The future yield then is computed on the basis of porosity, bringing back the old standard of yield per acre, or per foot of sand.

"The yield per foot of pay sand can only be considered where there is a constant ratio of spacing of oil wells. If one well to 10 acres is to be maintained, the yield per acre-foot will not be as great as where the ratio is one well to 5 acres. Again distinctions must be made between fields producing from limestone and those producing from oil sands. Fewer wells are needed in a limestone field than in a tight sand field, especially where the limestones possess a high permeability. The same condition applies to porous sandstone fields compared to tight sandstone oil fields.

"A factor to be considered in all computations of future oil is the present of connate water, i. e., the film of water surrounding and covering each sand grain. This connate water reduces the actual porosity from 15 to 45 per cent. Such water does not show in the wells because the bond between it and the sand grains remains unbroken. If the bond could be broken, larger oil recoveries might be effected. Electrical currents passing through the sands might break such bonds and result in a greater oil recovery, but no experiments covering such procedure have yet been reported."

Dr. Joseph E. Pogue, Chase National Bank, New York City, in "Economics of the Petroleum Industry" prepared for printing in "The Elements of the Petroleum Industry" a book by various authors, under the editorship of E. DeGolyer to be published by the A.I.M.E., says:

"Proration literally means the allocation of demand among competing producers on a pro rata basis, but the term now carries a much broader significance for it is employed to describe the entire process by which the production of crude oil in the United States is regulated.

"Proration, as we know it, was initiated in Oklahoma in 1926 and from that beginning has expanded until it has now become the accepted procedure in practically all important producing areas of the country."

January Gasoline Gain in Domestic Demand

Crude Petroleum: Crude oil production recorded little change in January, the daily average rising only from 3,300,000 bbls. in December to 3,306,000 bbls. in January.

The principal changes in the state's production figures were a decline of about 25,000 bbls. in California's average and an increase of 15,000 bbls. in Illinois. Development work in Illinois slowed down somewhat in January, the rise in production being retarded and oil wells completed declining from 296 in December to 259.

Exports of crude petroleum continued below normal, but crude runs to stills increased materially with the result that stocks declined in January after increasing appreciably in December. Stocks of all oils showed little change, declining only 307,000 bbls. to 554,163,000 bbls. on January 31.

Refined Products: The yield of gasoline in January was 44.8 per cent, compared with 44.4 per cent in December and a yield of 44.1 per cent in January 1938.

The indicated domestic demand for motor fuel in January was 37,847,000 bbls., or 8 per cent above the demand in January 1938. Although exports of gasoline fell off sharply from the December peak, the total for the month (3,638,000 bbls.) was 18 per cent above the corresponding figure of 1938. In spite of the high demand, gasoline stocks increased considerably more than anticipated though less than in January 1938. Total stocks of finished and unfinished gasoline on January 31, 1939, amounted to 79,466,000 bbls., nearly eight million barrels more than on hand the first of the year but about 6,500,000 bbls. less than on hand a year ago.

The demand for the various fuel oils continued to run well ahead of the previous year, kerosene being 12 per cent above January 1938, gas oil and distillates up 25 per cent, and residual fuel oil, up 14 per cent.

The crude oil capacity represented by the data in this report was 4,103,000 bbls., hence the operating ratio was 78 per cent, compared with 77 per cent in December and 78 per cent in January 1938.

United States Supply and Demand—Crude Oil (Bbls.)

January, 1939

12 MONTHS	TOTAL SUPPLY	TOTAL DEMAND	EXCESS DEMAND	EXCESS PCT.	DOMESTIC PRODUCTION	IMPORTS	INDICATED DOMESTIC DEMAND‡	EXPORTS	STOCKS REFINABLE CRUDE JAN. 31
1939	104,358,000	103,745,000	*613,000	*0.6	102,490,000	1,868,000	99,268,000	4,477,000	‖272,346,000
Daily average	3,366,000	3,346,000			3,306,000	60,000	3,202,000	144,000	
1938	108,102,000	104,619,000	*3,483,000	*3.3	106,007,000	2,095,000	98,666,000	5,953,000	306,195,000
Daily average	3,490,000	3,342,000			3,420,000	67,000	3,183,000	192,000	
Increase, 1939	†3,744,000	†874,000			†3,517,000	†227,000	602,000	†1,476,000	†33,849,000
	†3.5%	†0.8%			†3.3%	†10.8%	0.6%	†24.8%	†11.1%

Supply and Demand—Refinery Products—Motor Fuels (Bbls.)

12 MONTHS	TOTAL SUPPLY	TOTAL DEMAND	EXCESS DEMAND	EXCESS PCT.	DOMESTIC PRODUCTION	IMPORTS	DOMESTIC DEMAND	EXPORTS	STOCKS JAN. 31§
1939	49,120,000	41,485,000	*7,635,000	*18.4	49,120,000		37,847,000	3,638,000	78,414,000
Daily average	1,585,000	1,338,000			1,585,000		1,221,000	117,000	
1938	47,681,000	38,266,000	*9,415,000	*24.6	47,681,000		35,176,000	3,090,000	84,065,000
Daily average	1,538,000	1,234,000			1,538,000			99,000	
Increase, 1939	1,439,000	3,219,000			1,439,000		2,671,000	548,000	†5,651,000
	3.0%	8.4%			3.0%		7.6%	17.7%	†6.7%
Kerosene									
1939	5,702,000	6,790,000	1,088,000	16.5	5,702,000		5,980,000	810,000	6,711,000
1938	5,638,000	6,198,000	560,000	9.0	5,638,000		5,360,000	838,000	6,523,000
Increase, 1939	64,000	592,000			64,000		620,000	†28,000	188,000
	1.1%	9.5%			1.1%		11.6%	†3.3%	2.9%
Gas Oil and Residual Fuel Oil									
1939	42,054,000	48,280,000	6,226,000	12.9	39,935,000	2,119,000	45,226,000	3,054,000	120,198,000
1938	41,754,000	41,612,000	*142,000	*0.3	40,080,000	1,674,000	38,486,000	3,126,000	105,445,000
Increase, 1939	300,000	6,668,000			†145,000	445,000	6,740,000	†72,000	14,753,000
	0.7%	16.0%			†0.4%	26.5%	18.0%	†2.3%	14.0%
Gas Oil and Distillate Fuels									
1939	14,194,000	17,417,000	3,223,000	18.5	14,135,000	59,000	15,742,000	1,675,000	24,650,000
1938	13,876,000	14,899,000	1,023,000	6.9	13,876,000		12,642,000	2,257,000	21,543,000
Increase, 1939	318,000	2,518,000			259,000		3,100,000	†582,000	3,107,000
	2.3%	17.0%			1.9%		24.5%	†26.0%	14.4%
Residual Fuel Oils									
1939	27,860,000	30,863,000	3,003,000	9.7	25,800,000	2,060,000	29,484,000	1,379,000	95,548,000
1938	27,878,000	26,713,000	*1,165,000	*4.4	26,204,000	1,674,000	25,844,000	869,000	83,902,000
Increase, 1939	†18,000	4,150,000			†404,000	386,000	3,640,000	510,000	11,646,000
	†0.06%	15.4%			†1.5%	23.1%	14.1%	58.7%	13.9%
Lubricating Oils									
1939	2,527,000	2,460,000	*67,000	*2.7	2,527,000		1,609,000	851,000	7,762,000
1938	2,785,000	2,291,000	*494,000	*21.5	2,785,000		1,471,000	820,000	8,006,000
Increase, 1939	†258,000	169,000			†258,000		138,000	31,000	†244,000
	†9.2%				†9.2%		9.4%	3.8%	†3.0%
Petroleum Wax (Lbs.)									
1939	38,271,000	38,984,000	713,000	1.9	35,280,000	2,991,000	20,642,000	18,342,000	128,627,000
1938	44,536,000	43,899,000	*637,000	1.5	41,720,000	2,816,000	32,148,000	11,751,000	145,629,000
Increase, 1939	†6,265,000	†4,915,000			†6,440,000	175,000	†11,506,000	6,591,000	†17,002,000
	†14.1%	†11.2%			†15.4%	6.3%	†35.8%	56.1%	†11.7%

*Excess supply. †Decrease. ‡Crude oil only. §Includes finished and unfinished refinery gasoline and natural gasolines. ‖Gas oil and fuel oil equals gas oil and distillate fuels plus residual fuel oils. Note: Total supply equals domestic production plus imports. Total demand equals domestic demand plus exports. Data on demand for refined products are based on refinery shipments. ‖Does not include 16,356 bbls. of heavy oils in California. Comparable figures for January 31, 1938, not available.

Crude Oil Run to Stills and Total All Oils (Bbls.)

JANUARY—	TOTAL IMPORTS§	TOTAL EXPORTS§	TOTAL CRUDE TO STILLS	PER CENT YIELD GASOLINE‡	NATURAL GASOLINE PRODUCTION	TOTAL SUPPLY ALL OILS*	TOTAL DEMAND ALL OILS*	STOCKS ALL OILS JAN. 31*
1939	4,643,000	12,968,000	99,614,000	44.8	4,264,000	111,582,000	111,889,000	554,163,000
Daily average	150,000	418,000	3,213,000		136,000	3,599,000	3,609,000	
1938	4,217,000	13,941,000	97,900,000	44.1	4,336,000	114,707,000	103,414,000	575,279,000
Daily average	136,000	450,000	3,160,000		140,000	3,700,000	3,336,000	
Increase, 1939	426,000	†973,000	1,714,000		†72,000	†3,125,000	8,475,000	†21,116,000
	10.1%	†7.0%	1.8%		†1.6%	†2.7%	8.2%	†3.6%

*Total all oils includes crude and refined products, natural gasoline and benzol. Stocks January 31, 1939, represented 154 days' supply which compared to 172 days' on same date in 1937. †Decrease. ‡Does not include natural gasoline blended at refineries. §Includes crude oil and refinery products. In case of imports includes receipts in bond and for domestic use. All data based on Bureau of Mines reports.

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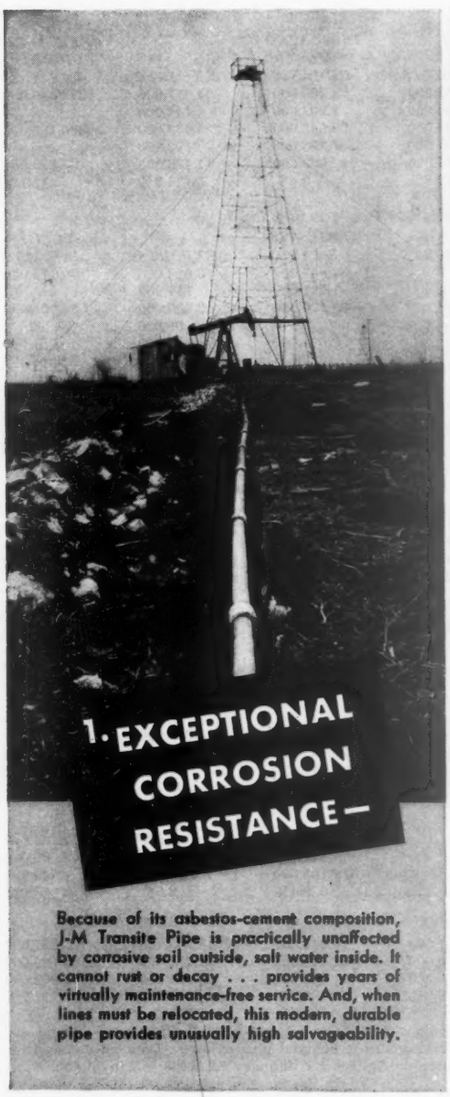
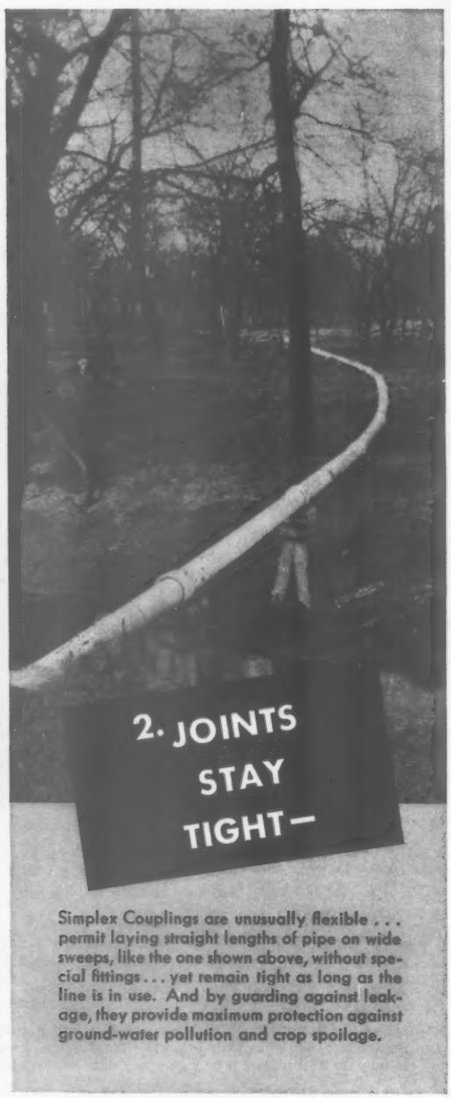


1. EXCEPTIONAL CORROSION RESISTANCE—

Because of its asbestos-cement composition, J-M Transite Pipe is practically unaffected by corrosive soil outside, salt water inside. It cannot rust or decay . . . provides years of virtually maintenance-free service. And, when lines must be relocated, this modern, durable pipe provides unusually high salvageability.



2. JOINTS STAY TIGHT—

Simplex Couplings are unusually flexible . . . permit laying straight lengths of pipe on wide sweeps, like the one shown above, without special fittings . . . yet remain tight as long as the line is in use. And by guarding against leakage, they provide maximum protection against ground-water pollution and crop spoilage.

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Transite Pipe is unusually light in weight, easy to handle and transport. Long 13-foot sections reduce the number of joints required in the line. And the simple assembly method does away with the need for skilled crews. Installations are completed in the shortest possible time and at least expense.

MANY leading oil producers are now using J-M Transite Pipe in lead lines as well as in their salt-water disposal systems. A check-up will show you how this modern material can save money for you. Full details are contained in Engineering Brochure DS-320. For your free copy, simply write Johns-Manville, 22 East 40th Street, New York, N.Y.

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AN ASBESTOS PRODUCT FOR LOW-COST SALT-WATER LINES

FIELD OPERATIONS

Summarizing the Week's Developments

KANSAS—The Leesburgh pool in Stafford County was extended one-half mile to the southeast by a 2,843-bbl. producer. An Arbuckle lime well in the Hittle pool, Cowley County, made a potential of 7,161 bbls.; another Hittle well started off at 120 bbls. an hour, and a third had a hole full of oil and was due to extend the field southeastward. The Cunningham field was extended three-fourths mile southwestward in Pratt County by a 28,660,000-cu. ft. gasser.

OKLAHOMA—A 2,179-bbl. well was completed in the Fitts field, Pontotoc County, the largest producer in that area in several months. A well estimated good for 2,484 bbls. was completed in the Cement field, Caddo County.

TEXAS—A pool was opened in Clay County, 12 miles southwest of Henrietta, the discovery well producing six hours at the rate of 1,248 bbls. per day. It is producing from the Strawn series at 4,432-61 feet. The first oil production in the Bird Island gas field offshore from Kleberg County was supplied by a well starting at 68 bbls. a day of 44-gravity oil. Five wildcats started in Duval County, and five new tests on the Frio-Vicksburg trend in Jim Wells County were important. Production was extended to within 600 feet of the Aransas Pass city limits. The coastal fields in Texas were lacking in features, although a new pay was developed in the Fairbanks field in Harris County. A new Woodbine pool is indicated in northern Henderson County. A well between the Wasson and Bennett pools in Yoakum County tested 127 bbls. in 24 hours. One of the largest wells yet completed in Hockley County produced 2,048 bbls. in six hours through 2-inch tubing. An Ordovician pool in Stephens County was in sight, the discovery well having filled 1,500 feet with oil in three hours, and the largest well ever recorded in Shackelford County is reported to have flowed at the rate of 4,800 bbls. a day.

ILLINOIS—The Cordes pool in Washington County was increased over a mile southwesterly, and the structure is regarded as of major importance and comparable with the Centralia structure.

MICHIGAN—What is called the largest well ever brought in in Michigan, based on a short-time flow, was completed in the Freeman-Redding field in Clare County and shut in after an hour and 50 minutes of flow. In the last 50 minutes it produced 420 bbls. of oil and is rated as a 12,000-bbl. well. It will be permitted a 200-bbl. per day production. In the Van Buren County fields eight oil wells were completed with a combined production of about 4,200 bbls. per day.

CALIFORNIA—A 4,650-bbl. well in the Wasco field, Kern County, producing 36-gravity crude, was a feature. Top of the sand was found at 13,106 feet, total depth 13,154 feet.

KENTUCKY—A McClosky lime pool was opened in McLean County by a 200-bbl. well. The Birk City pool is still partly flooded in, reducing crude output and holding back completions.

Completions in All Fields

(Week Ending March 18, 1939)

	Oil	Gas	Dry	Total	1939 total comp. to date	1938 total comp. to date
N. Y., Pa., and W. Va.	39	12	8	59	707	1,104
Ohio	7	9	1	17	191	205
Indiana	0	0	0	0	29	24
Kentucky	2	8	5	15	117	166
Illinois	38	0	8	46	723	128
Michigan	15	2	4	21	229	159
Kansas	16	1	2	19	231	421
Oklahoma	27	0	11	38	369	383
Texas:						
North Central Texas	19	2	9	30	450	562
West Texas	27	0	0	27	399	512
Texas Panhandle	6	3	0	9	78	167
East Texas	4	0	0	4	164	550
East Central Texas	1	0	3	4	49	86
East Texas Border	0	0	0	0	19	36
Gulf Coast Texas	20	1	3	24	271	236
Southwest Texas	38	0	15	53	473	444
Total Texas	115	6	30	151	1,903	2,620
North Louisiana	4	1	3	8	101	130
Gulf Coast Louisiana	3	0	3	6	131	113
Total Louisiana	7	1	6	14	232	243
Arkansas	6	0	0	6	57	45
Montana	0	0	0	0	23	12
Wyoming	1	0	1	2	22	41
Colorado	0	1	0	1	3	1
New Mexico	6	0	0	6	128	129
Utah	0	0	0	0	0	0
California	11	0	2	13	193	295
Total United States	290	40	78	408	5,157	5,976
Total previous week	273	30	114	417		
Week ending Mar. 19, 1938	382	45	95	522		

Outstanding Fields—Highlights

(Week Ending March 18, 1939)

FIELD—	Rigs up	Wells drlg.	Weekly oil completions	Initial prod.	Total No. oil wells	Daily av. prod.
TEXAS						
K.M.A.	35	38	3	3,038	943	21,900
Wasson-Bennett	10	35	3	4,344	229	10,216
Ector County	5	53	11	14,609	1,615	45,010
Winkler County	1	16	1	248	1,771	36,786
Howard-Glasscock	5	28	1	962	1,049	15,898
East Texas	3	10	4	176	26,015	372,850
OKLAHOMA						
St. Louis	5	28	5	829	791	27,750
Sac and Fox	4	14	3	582	98	3,225
KANSAS						
Barton County	5	16	3	1,262	410	11,986
Rice County	7	20	3	1,691	1,284	3,326
Stafford County	2	8	2	1,157	253	5,415
Russell County	4	17	3	1,101	1,206	24,478
NEW MEXICO						
Lea County	9	61	6	3,140	2,042	94,480
LA-ARK-TEX						
Cotton Valley (deep)	2	8	1	190	119	12,480
Jennings, La.	2	5	2	953	142	24,367
Shreveport, La.	3	9	1	550	15	18,925
MICHIGAN						
Freeman-Redding	4	24	38	2	1,622	11,136
Van Buren County	6	22	0	8	4,200	15,872
ILLINOIS						
Central Illinois	40	320	38	8,195	2,644	157,412
CALIFORNIA						
Wilmington	4	20	2	382	598	85,500
KENTUCKY						
Birk City	3	12	0	0	120	1,840

Illinois and Kentucky

By STAFF CORRESPONDENT

Washington County Well Is an Important Pool Extension

MATTOON, Ill., Mar. 20.—Pres Cochrane No. 1 Blankenship, or as it is also sometimes reported, Cochrane and Blankenship No. 1 Oak Grove Cemetery, SE SE SW Section 15-3s-3w, looks like an important addition to the pool opened by G. H. Blankenship in NE SW NE Section 14-3s-3w, a mile and a quarter to the northwest. The latter was the first oil well in the county, but it was reported as a 25-bbl. producer in Benoist sand. The second well, in Section 15, swabbed 200 bbls. in 24 hours from Benoist sand topped at 1,267 feet. It was drilled to 1,288 feet and shut down for some hours and when opened the oil slopped over the casing. It was next scheduled for a production test. This is the most important well drilled this year in the state as it tends to prove that the Blankenship discovery, while small in itself, was important in opening a new productive structure.

Production of oil in Illinois in the past week hit another high reaching a total of 166,992 bbls. per day of which the central fields contributed 157,412 bbls. per day and the old fields 9,580 bbls. per day.

Completed Wells

Following is the record of the 46 completions reported in the past week, 38 oil wells and 8 dry holes, the initial production of the oil wells representing 24 hours, unless otherwise stated:

In Christian County, Oil Development Co. No. 1 Post, SE SW NW Section 1-14n-1w, top of the Devonian at 2,145 feet; dry and abandoned at 2,260 feet.

In Shelby County, D. J. Marshall and others No. 1 Harry Riley, C NE NE Section 9-11n-4e, St. Louis limestone topped at 2,045 feet, dry and abandoned at 2,068 feet. Swords & McDougal No. 1 Dorst, NW NW NW Section 17-11n-2e, St. Louis limestone topped at 1,772 feet, dry and abandoned at 1,788½ feet. Massad and others No. 1 Sommers, SE SW SW Section 20-10n-1e, which had been spudded, was reported abandoned.

In Fayette County, Carter Oil Co. No. 1 Miller Kimbrell, SW SE SW Section 29-8n-3e, stray sand at 1,487-1,512 feet, shot with 10 quarts, pumped 70 bbls.

In Effingham County, Gordon Houck and others No. 1 Morhead, NW cor. SW SW Section 18-8n-4e, dry and abandoned at 1,697 feet. It had a showing of oil in stray sand at 1,575-90 feet.

In the Louden field in Fayette County, Carter Oil Co. No. 1 O. C. Wood, SE NE NW Section 11-8n-3e, stray sand at 1,566-86 feet, shot with 50 quarts, swabbed 492 bbls. of oil and 40,000 cu. ft. of gas. Carter No. 1 Clara McCan, SE NE SE Section 31-8n-3e, Bethel sand at 1,562-86 feet, shot with 20 quarts, swabbed 356 bbls. of oil. Carter No. 2 Franklin McClain, SE SW SE Section 32-8n-3e, Bethel sand at 1,550-76 feet, shot with 60 quarts, flowed 972 bbls. of oil and 150,000 cu. ft. of gas through tubing. Carter No. 1 Mary Dial, NE NW NW Section 34-8n-3e, Bethel at 1,592-98 feet, total depth, plugged back to 1,549 feet and shot Weiler sand at 1,520-43 feet, with 20 quarts, swabbed 252 bbls.

Minerva Oil Co. No. 2 Breeze, SW cor. NE NE Section 20-7n-3e, Bethel at 1,621-35 feet, pumped 150 bbls. of oil and about 8 bbls. of salt water. Carter Oil Co. No. 6 Florence Harding, SE SW NW Section 18-7n-3e, Weiler at 1,501-40 feet, shot with 40 quarts, swabbed 128 bbls. through casing. Carter No. 2 Ola Morton, SW NE NW Section 9-7n-3e, stray sand at 1,572-83 feet, shot with 10 quarts, swabbed 120 bbls. through casing. Carter No. 2 Elsie Owens, NW NE SW Section 8-7n-3e, Bethel sand at 1,565-72 feet, shot with 10 quarts, swabbed 94 bbls., plugged back to 1,505 feet and shot in stray sand at 1,497-1,505 feet, swabbed 272 bbls. W. B. Johnson No. 2 Stewart, NE NW NW Section 6-7n-3e, Weiler at 1,526-48 feet, shot with 60 quarts, pumped 110 bbls. Carter No. 1 J. H. Devor, NW SW NW Section 6-7n-3e, Weiler at 1,494-1,532 feet, shot with 20 quarts, swabbed 164 bbls. through casing. Shell Petroleum Corp. No. 8A Tulton, SW NW NW Section 28-7n-3e, Cypress sand 1,543-78 feet, shot with 20 quarts, pumped 129 bbls. Carter Oil No. 4 James Feezel, SE SE NW Section 29-7n-3e, Weiler at 1,530-60 feet, shot with 20 quarts, swabbed 192 bbls. R. B. Creager No. 2 Hiatt, SW NE SW Section 29-7n-3e, Weiler at 1,540-58 feet, shot with 40 quarts, pumped 420 bbls. Mabee Drilling Co. No. 6 Homan, NE NE SE Section 29-7n-3e, Weiler at 1,564-1,604 feet, pumped 120 bbls. of oil and 6 bbls. of salt water. Whisenant and others No. 11 Smith, NE NW NE Section 30-7n-3e, dry and abandoned at 1,624 feet, Weiler sand lay at 1,555-69 feet.

In Richland County, Pure Oil Co. No. 5 Cazel, NW SW SE Section 23-4n-9e, Weiler sand at 2,571-96 feet, saturated; small showing of oil at 2,622-26 feet, total depth 2,632 feet, pumped 162 bbls.

In Clinton County, Kesl and others No. 1 Marbaum, NW NE SE Section 12-3n-3w, dry and abandoned at 1,187 feet. Benoist sand was penetrated at 1,161-69 feet.

Illinois Fields

HIGHLIGHTS OF THE WEEK: The Cordes pool, opened some time ago by G. H. Blankenship in Section 14-3s-3w, Washington County, with a small well, was extended and made to look important by Cochrane & Blankenship No. 1 Oakview Cemetery in Section 15-3s-3w, which swabbed 200 bbls. of oil in 24-hour test of the upper part of the Benoist sand. Owing to an increase in the pipe line runs from the old fields production in the state reached another peak.

Daily production of new fields, 157,412 bbls.; old fields, 9,580 bbls.; total, 166,992 bbls.

Completed oil wells, 38; operations including locations, rigs and wells drilling, 385.

In the Salem Field

In Marion County, Salem field, Haynes & Thomas No. 1 F. Lee, NE cor. NW NE SW Section 28-2n-2e, which was dry at 1,873 feet will not be drilled to the McClosky and is reported abandoned. Texas Co. No. 12 E. Gett, SE SW SE Section 16-2n-2e, Benoist sand at 1,859-79 feet and McClosky lime at 2,063-81 feet, total depth; perforated with 100 shots at 1,858-68 feet and is a 35-bbl. well from Benoist. Casing had been set at 2,062 feet but no attempt was made to test the McClosky lime. Magnolia Petroleum Co. No. 15 W. B. Young, SE SW NE Section 20-2n-2e, Benoist at 1,732-83 feet, shot with 50 quarts, flowed 400 bbls. Texas Co. No. 8 N. Young, SE SE NE Section 20-2n-2e, Benoist at 1,757-90 feet, flowed 36 bbls. in three hours, rated a 252-bbl. well. Texas No. 1 Hester, NW NE NE Section 21-2n-2e, McClosky top at 2,068 feet, pay at 2,071-76 feet, 7-inch casing set at 2,067 feet, and perforated at 1,848-50 feet with nine shots, pumped 40 bbls. in three hours from Benoist sand, rated a 280-bbl. well. Texas No. 3 S. D. Branch, SE SE NE Section 32-2n-2e, Benoist at 1,760-1,818 feet, flowed 55 bbls. in three hours, rated a 385-bbl. well. Texas No. 3 S. McCoy, NE NE NW Section 33-2n-2e, Benoist at 1,763-1,800 feet, flowed 19 bbls. in three hours, rated a 133-bbl. well.

In the Salem field, W. C. McBride, Inc., No. 5 William Fyke Heirs, SW cor. NW SE Section 5-1n-2e, had St. Louis lime at 1,998-2,000 feet, total depth, acidized with 2,500 gallons, flowed 41 bbls. the first hour and is rated a 960-bbl. well. Texas Co. No. 1-G C. H. Reed A, SW cor. NE NW Section 5-1n-2e, was drilled to 1,745 feet, Benoist sand was topped at 1,695 feet. It will be used as a gas input well. Likewise will same company's No. 1-G Carr B, SE cor. NE NE Section 7-1n-2e, which topped Benoist at 1,743 feet, total depth 1,772 feet. Texas No. 5 W. Carr A, NW SW NW Section 8-1n-2e, Benoist sand at 1,757-83 feet, flowed 10 bbls. in three hours, rated a 70-bbl. well. Texas No. 7 R. Fyke, NE cor. SW Section 8-1n-2e, McClosky lime at 2,032-58 feet, flowed 250 bbls. in three hours, rated a 1,750-bbl. well. Texas No. 3 D. Fyke, SE NW SE Section 8-1n-2e, McClosky at 2,068-91 feet, pumped 15 bbls. in three hours, rated a 105-bbl. well. Texas No. 5 W. D. Fyke, NW NW SE Section 8-1n-2e, McClosky at 2,038 feet, total depth 2,059 feet, flowed 115 bbls. in three hours, rated an 800-bbl. well. Texas No. 3 E. L. Snider, NW cor. SE Section 8-1n-2e, McClosky at 2,032-53 feet, flowed 81 bbls. in three hours, rated a 567-bbl. well. Texas No. 6 M. Bryant, NW cor. NE Section 9-1n-2e, Benoist at 1,861-83 feet, pumped 31 bbls. in three hours, rated a 147-bbl. well. Texas No. 1 Lankford, NW NW NW Section 9-1n-2e, Benoist at 1,814-46 feet, flowed 74 bbls. in three hours, rated a 518-bbl. well.

In Jefferson County, Brogan & Blair No. 1 Murman, NW NE NE Section 15-2s-1e, dry and abandoned at 2,308 feet. Roseclair topped at 2,275 feet. Palacine Oil Co. No. 1 Inland Steel, C SE NE Section 29-4s-2e, dry and abandoned at 3,104 feet. St. Louis lime was topped at 2,948 feet.

In Gallatin County, J. C. Miller and others No. 1 Big Barn B, CWL W half W half Section 11-8s-10e, abandoned at 510 feet.

In Clinton County, H. Flannery and others No. 1 Charles Gerdes, NW NW SE Section 3-2n-2w, hole junked at 870 feet, and abandoned.

In Clay County, Pure Oil Co. No. 3 Daney Schott, C W half SE SW Section 5-2n-8e, Fredonia lime topped at 2,979 feet, pays at intervals from 2,981 to 3,075 feet, flowed 812 bbls. naturally. Pure No. 2 Daney Schott, C E half NE SW Section 5-2n-8e, Fredonia top at 2,973 feet, pays at intervals from 2,977 to 3,070 feet, flowed 1,020 bbls. naturally. Pure No. 1 Edward Priestman, C W half SE NW Section 5-2n-8e, Fredonia at 2,998 feet, pays from 3,005 to 3,095 feet, flowed 688 bbls. naturally.

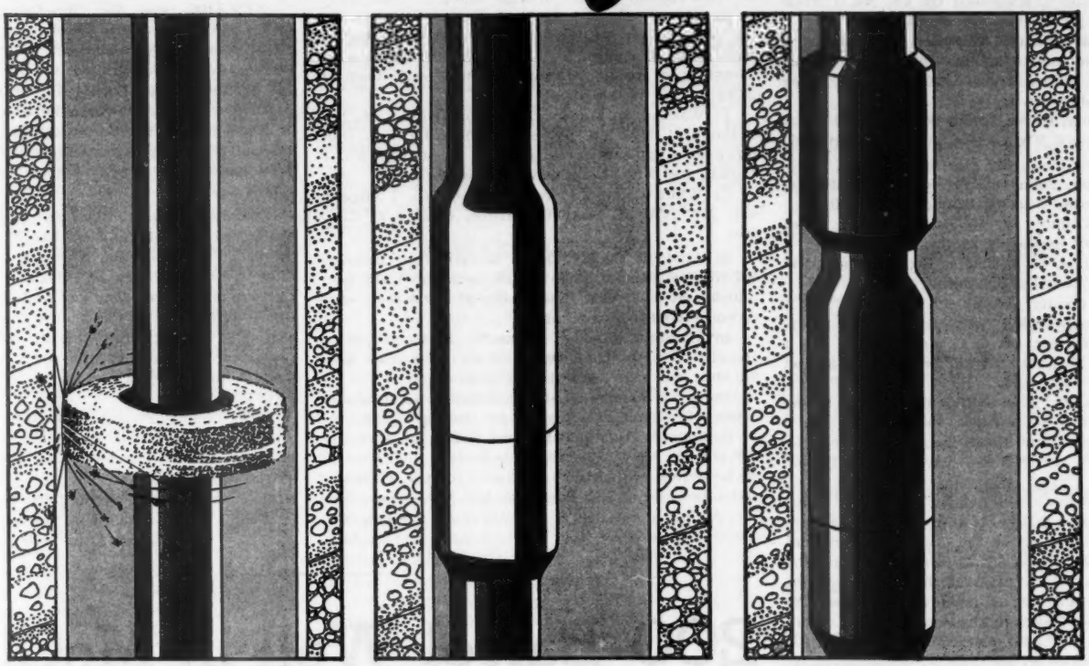
In a Marion County wildcat, Kingwood Oil Co. No. 1 Burge, NE SE NE Section 18-1n-2e, was at a total depth of 3,680 feet where a Schlumberger test was made. The well is shut down awaiting owner's orders. Tops include Warsaw at 2,605 feet; Osage at 2,800 feet; Chattanooga at 3,410 feet; Devonian at 3,512 feet; a showing of gas at 3,620-37 feet. A 90-minute drill stem test at 3,615-40 feet developed 90 feet of mud with an odor of gas.

In Clinton County, Iroquois Oil & Gas Co. No. 3 Koelin, SW cor. SE Section 12-1n-1w, Centralia field, was a 45-bbl. well in Benoist sand at 1,365-83 feet. No. 2 Koelin, SW cor. NW SW SE Section 12-1n-1w, had Benoist at 1,379-88 feet, and pumped 45 bbls. Same operator's No. 1 Koelin, NW cor. SW SE Section 12-1n-1w, made a 20-bbl. well at 1,371-82 feet. All three wells produced a little water with the oil.

In Wayne County, George A. Manahan No. 1 Fitch, C N half SE NE Section 10-1n-8e, had Fredonia lime pay at 3,085-3,103 feet, and the well flowed 132 bbls.

Change

FROM ABRASION TO MUD LUBRICATION



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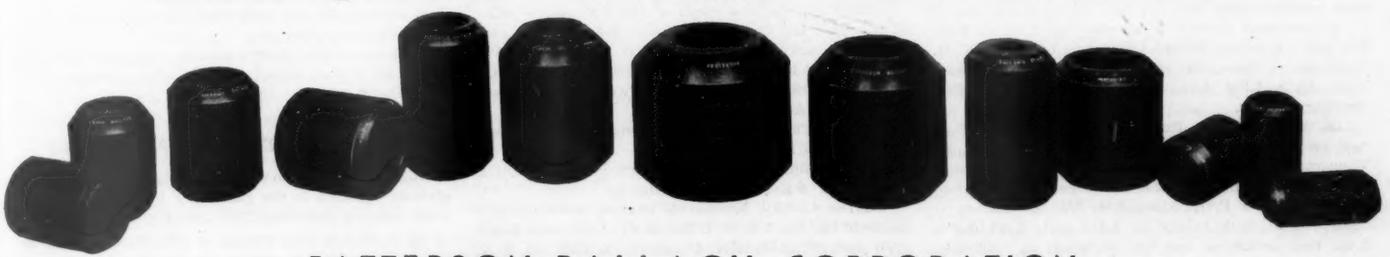

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FIELD SERVICE AVAILABLE IN PRINCIPAL OIL PRODUCING CENTERS

in 90 minutes, and is rated a 1,200-bbl. well. It was shut in.

In Clinton County, Shell Petroleum Corp. No. 3A Criley, SW NE NE Section 2-1n-1w, had Cypress sand at 1,193-1,222 feet. It was shot with 10 quarts and then plugged back to 1,214 feet. It made 28 bbls. of oil and 3 bbls. of water.

Among the Wildcats

In Champaign County, Sadorus Oil Co. No. 1 Noyle, 275 feet from south and 285 feet from east lines, SE quarter Section 31-18n-8e, spudded and shut down.

In Montgomery County, Cassens and others No. 1 Wilkering, NW NW NW Section 34-10n-2w, set 12-inch casing at 100 feet, drilling at 150 feet.

In Shelby County, Kingwood Oil Co. No. 1 Trueblood, SW SW SW Section 3-9n-3e, location.

In Effingham County, Kingwood Oil Co. No. 1 Koester, 410 feet from north and 385 feet from east lines of SE SW Section 18-8n-6e, set 10¾-inch casing at 43 feet, and shut down.

In Bond County, Eason Oil Co. No. 1 St. Louis Joint Stock Bank, NE NE NW Section 24-4n-3w, rigging up rotary.

Marion County, John Q. Gill No. 1 J. A. Brown, SW SW SW Section 5-3n-3e, drilling at 2,380 feet.

In Wabash County, W. M. Bartlett No. 1 Stansfield, NE NW NE Section 30-2s-13w, location.

In Perry County, E. J. Shaefer No. 1 Sprague, SW NE NW Section 33-5s-4w, drilling at 490 feet.

In Franklin County, Adams Oil & Gas Co. No. 1 Old Ben Coal Co., SW SW NE Section 19-5s-2e, deepening from 3,102 feet. M. & G. Drilling Co. No. 1 Franklin Realty Co., NE NE SE Section 26-6s-3e, set 10-inch casing at 101 feet.

In White County, Arab Petroleum Co. No. 1 Ray Pearce, NE NE NW Section 35-6s-10e, location.

In Williamson County, Roy Shipman and others No. 1 Chamness, SW cor. NW SW SW Section 21-9s-2e, pits dug.

In Greene County, Erie Drilling Co. No. 1 Stelle, NE SE SE Section 1-8n-14w, is shut down at 400 feet.

In Fayette County, Carter Oil Co. No. 1 Pearl Durbin, C SE SE NW Section 8-7n-3e, was a location. Holland and others No. 1 Aven Methodist Church, 81 feet from south and 55 feet from west lines of NW quarter Section 31-7n-3e, rigging up rotary; L. & G. Oil Co. No. 1 Stewart, 451 feet from south and 1,203 feet from west lines of SE quarter Section 24-6n-2e, drilling at 1,175 feet.

In Richland County, Ohio Oil Co. No. 1 Fleming, C S half SW SE Section 15-4n-10e, drilling at 1,830 feet. Worthy E. Dyson No. 1 E. V. Wheeler, SW NE NE Section 24-4n-9e, set 7-inch casing at 2,560 feet, total depth 2,586 feet, drilled plug and bailed 50-50 oil and water. Testing continued. Texas Co. No. 1 Pifer, SW SW SE Section 22-4n-10e, set 7-inch casing at 3,024 feet, total depth 3,061 feet, pay at 3,030-51 feet at intervals; waiting for cement to set.

In Lawrence County, M. G. Johnson No. 1 Downey, C E half SE NW Section 32-3n-11w, total depth 2,375 feet, will deepen.

In Marion County, Kingwood Oil Co. No. 1 Loomis, NE NE NE Section 31-3n-2e, derrick up.

In Richland County, Leathers and others No. 1 Yonaka, NW SE SW Section 22-2n-14w, shut down at 2,885 feet on account of high water.

In Clay County, Pure Oil Co. No. 1 Taylor Consolidated, C E half NW NW Section 8-2n-8e, location. Pure Oil Co. No. 1 Lucy Hubble, C W half NE SE Section 4-1n-8e, drilling at 2,771 feet. C. E. Harwell and others No. 1 Elsa Fitch, C N half SW NE Section 11-1n-8e, Glen Dean top at 2,560 feet, drilling at 2,610 feet.

In Marion County, Hawley Oil & Gas Co. No. 1 Copple, SW SW NE Section 28-1n-1e, total depth 2,020 feet, repairing line.

In Jefferson County, I. Vawter No. 1 Sarah Kell, NW SW NE Section 9-1s-1e, drilling at 1,580 feet. V. O. Lewis No. 1 Bates, NE cor. NW NE Section 18-1s-1e, total depth 1,805 feet, will move in rotary when weather permits.

In Wayne County, Roche and Voyles No. 1, C E half SW SE Section 3-2s-7e, drilling at 2,120 feet. H. H. Weinert No. 1 L. Cunningham, C S half NW NE Section 27-2s-8e, drilling at 2,260 feet. New Penn Development Co. No. 1 B. O. Scott, NW NW SE Section 7-2s-9e, set 2½-inch tubing at 3,418 feet, total depth 3,437 feet, swabbing; test had showings at 3,393-95½ feet and light pay at 3,398-3,405 feet and a showing at 3,405-06 feet.

In Wabash County, Tide Water Associated Oil Co. No. 1 Cowling, SW SW SE Section 18-2s-13w of second principal meridian, set 10-inch casing at 150 feet.

In Jefferson County, Midfield Oil Co. No. 1 Ervin, SW cor. SE Section 24-2s-1e, total depth 2,227 feet, and shut down for orders. Transcontinental Oil Co. No. 1 Carroll, SE NE SE Section 16-2s-1e, shut down for orders at 2,227 feet. McQueen and others No. 1 Sorenson, NE NE NW Section 30-2s-2e, total depth 1,525 feet, underreaming 6-inch casing.

In Wayne County, Carl Robinson No. 1 Carroll Oakley, NW NE NE Section 34-2s-8e, location. Carl Robinson No. 1 Joe Felix, SE SE SE Section 27-2s-8e, derrick up.

In White County, Shirley & Priest No. 1 Matilda Hon, NE NE SW Section 32-3s-14w of second principal meridian, drilling at 1,200 feet.

In Wayne County, Iroquois Oil & Gas Co. No. 1 Winzenberger, NE SW SE Section 7-3s-9e, shut down at 1,500 feet on account of high water.

In Wabash County, R. S. Hays No. 1 Schultz, SE NW SW Section 7-3s-13w, shut down at 1,720 feet by high water. Longhorn No. 1 Helm, SE SE NW Section 15-3s-14w of second principal meridian, shut down at 2,742 feet by high water.

In Washington County, Thompson Drilling Co. No. 1 Rosanski, NW NW SW Section 19-3s-1w, was shut down at 1,224 feet for repairs. A. J. Monton No. 1 Dennis, SW NE NE Section 14-3s-3w, location.

In White County, Price & Massey No. 1 Higginson, NW NW SE Section 22-4s-10e, drilling at 2,330 feet.

In Randolph County, Doctor Seward No. 1 Behmer, SE SE NE Section 19-4s-7w, Devonian at 1,340 feet. Silurian at 1,370 feet, Maquoketa at 1,605 feet, shut down at 1,810 feet for orders.

In Hamilton County, Heimerich & Payne No. 1 Hamilton County Land Bank, SE SE SE Section 6-4s-7e, shut down at 3,312 feet by high water.

In Perry County, G. H. Blankenship No. 1 Rheinecker, NW NW NE Section 3-6s-4w, drilling at 615 feet.

In Gallatin County, Bailey and Lucas No. 1 Logan, SW cor. NE NE NE Section 21-8s-8e, hole full of water at 2,143 feet, will drill to McClosky lime. J. C. Miller and others No. 1 Big Barn, SW SW NE Section 2-8s-10e, drilling at 260 feet. J. Garfield Buell, C S half NW NW Section 5-8s-10e, shut down at 1,698 feet by high water. Delta Drilling Co. No. 1 Stenson, SE SE SW Section 9-9s-9e, drilling at 1,315 feet. Coates and others No. 1 Green, SW cor. Section 16-9s-9e, St. Louis lime at 2,698 feet, drilling at 2,710 feet. Dillon and others No. 1 Frohoch, SE SE SE Section 4-10s-8e, location.

In Union County, B.P.T.U. Syndicate No. 1 Hankla, C S half NE NW Section 14-12s-1w, shut down at 175 feet.

In Saline County, Kingwood Oil Co. No. 1 McIntyre, NW cor. Section 25-9s-7e, derrick up.

In Massac County, H. Kahle and others No. 1 Harvick, SW SW SW Section 23-14s-3e, total depth 3,010 feet, cleaning out to drill deeper.

CENTRAL OHIO

NEWARK, Ohio, Mar. 20.—Central Ohio operators had a fairly successful week completing eight gas wells, four oil wells and only one dry hole. Perry County accounts for three of the oil wells, one making 125 bbls. Cuyahoga County yielded a 5,000,000 cu. ft. gas well from the Newburg horizon.

The Ohio Fuel Gas Co. No. 2 W. H. Parmiter, Section 11, Lodi Township, Athens County, is a gas well good for 150,000 cu. ft. open flow, from the second Berea at 1,727-45 feet.

Cuyahoga County, Mayfield Township, Benedum-Trees No. 1 Frank Holaday, Lot 24, gauged 5,000,000 cu. ft. of gas from the Newburg at 2,784-2,825 feet after treating with acid and cleaning out.

Two small Berea sand gas wells were completed in Guernsey County. In Cambridge Township, Cambridge Glass Co. No. 1 Charles Bennett, fourth quarter, had the pay at 1,030 feet; in Millwood Township, Ohio Fuel Gas Co. No. 1 Mary Miller, Section 21, found the gas at 1,348-52 feet.

Knox County, Pleasant Township, C. O. Moore and others abandoned their test on the Dale Cochran tract in Lot 16, fourth quarter; an oil showing in the lime at 1,653-60 feet was treated with 500 gallons of acid without results; total depth 1,860 feet.

Medina County, Chatham Township, Edson & Son

(Continued on Page 146)

200-Barrel Well in McClosky Lime Pool, McLean County

OWENSBORO, Ky., Mar. 20.—A McClosky lime pool was added to the western Kentucky district when J. C. Ellis and C. A. Morrison opened a 200-bbl. natural production in No. 2 Stevens heirs, about a mile south of the town of Livermore in McLean County. The well was reported to have filled a 100-bbl. tank in about 12 hours. The lime will be acidized as soon as the Green River recedes enough to permit pipe line connections. The well lies south of the river and in the southern part of the county.

The Major Oil Co. expects to complete within a few days a well on the Wahl lease in the Birk City pool from which a highly saturated Jett sand core was reported taken. Tony Barrett and John Moore, Owensboro operators, are about to complete a Jett well on the Jones heirs lease about 2 miles northwest of Birk City. When the well was drilled in it flowed naturally for a time, and oil is reported standing in it to a depth of 900 feet. The Jett was found at 1,253-69 feet.

Announcement was made at the Owensboro office of the Ohio Oil Co. that it would not buy any additional Kentucky crude after March 16 at 7 a.m. The Ohio handled its oil through the Illinois Pipe Line Co. lines in the Owensboro field which were recently taken over by the Ashland Refining Co.

The week's reported completions and new operations were as follows:

Butler County, Rochester district: Penn-Tuck Oil & Gas Co. No. 5 Kyle Willis, rigging up.

Daviess County, Knottsville district: Kentucky-Missouri Oil Co. No. 1 E. O. Gilmore, dry hole, total depth 1,501 feet. Utica district: Daugherty & Ellis No. 3 N. C. Howard, drilling at 100 feet. Cane Run School district: Rex Pyramid Oil Co. No. 3 Jessie Litsey, dry hole, total depth 1,237 feet. Laffoon district: Wana Oil Co. No. 3 Chester Taylor, dry hole, total depth 745 feet; Gardner Brothers No. 3 J. D. Walker, location.

Hancock County, Easton district: Eureka Drilling Co. No. 4 Baker Brothers, moving in; J. W. Tuttle No. 1 W. C. Boling, location. Lewisport district: W. P. Hildebrand No. 1 Lennie Taylor, spudding.

Muhlenberg County, 4 miles northeast of Central City: Palmer Drilling Co. No. 1 Nelson Creek Coal Co., spudding in.

McLean County, Cleopatra district: Fred J. Hildt and others No. 1 Nannie Gibson, dry hole, total depth 2,558 feet; Cleopatra Oil Co. No. 1 Nesmith, spudding. South Livermore district: J. C. Ellis and C. A. Morrison No. 2 Stevens Heirs, drilled 5 feet into McClosky saturation at 1,640 feet, flowing naturally 8 bbls. per hour; will acidize as soon as the Green River recedes to make pipe line connections possible. This is a new McClosky field.

Ohio County, Taffy district: Jess Ashby and others No. 1 Carder, moving in. Basham School district: Charles Marsh and others No. 6 J. C. Nabors, 10-bbl. well in lower Jett sand; total depth 516 feet. Friendship Church district: Petroleum Extraction Co. No. 4 E. M. Royal, moving in.

Webster County, Sebree district: Iliey Browning and others No. 2 Mary Sutton, 265,000 cu. ft. gas well; total depth 1,426 feet.

EASTERN KENTUCKY OPERATIONS

ASHLAND, Ky., Mar. 20.—Eastern Kentucky completions reported in the past week included seven gas wells and one dry hole.

In the South Fork district of Powell County an unnamed operator has drilled on the Woodward heirs farm. Oil stood 350 feet in the hole with the operator preparing to tube well.

Warfield Natural Gas Co. completed No. 4820 W. R. Wells, on Johns Creek in Floyd County, as a 445,000

(Continued on Page 137)

By
D. H. STORMONT

Richardson Test in Hockley County an 8,000-Bbl. Well

FORT WORTH, Tex., Mar. 20.—Prospects of a producing well about midway between the Wasson pool and the Bennett pool of Yoakum County, which would do much to link the two large North Basin areas, featured the development in the West Texas district in the past week. Possible opening of new pools in Stephens County and Callahan County led development in the West Central Texas area.

Texas Pacific Coal & Oil Co. No. 1 A. M. Brownfield, 1½ miles north of production on the east side of the Wasson field, Yoakum County, swabbed 127 bbls. of oil in 24 hours, after which the crew was preparing to deepen into the lime formation. Swabbing test was made after the well had started heading oil to the extent of 11 bbls. the first hour and 14 bbls. the second hour. On geological markers the well is reported to be running about level with the Honolulu Oil Corp. No. 1 Kendrick, 2,117-bbl. producer 2 miles to the southeast. Most accurate information on the test credits it with having encountered broken lime pay from 5,011 feet to 5,151 feet. The test has been neither shot nor acidized. It is located in the SE cor. Section 802, Block D, John H. Gibson Survey.

In Hockley County, Richardson No. 1 Coe, for several weeks in the testing stages, has been completed for one of the largest wells in the northern basin area. The well made 2,048 bbls. of 31-gravity oil on a six-hour gauge through open 2-inch tubing. The new well is 1 mile northeast of the Slaughter pool of Hockley County, and with its completion many more acres are added to this large yet undeveloped pool. The No. 1 Coe registered a gas-oil ratio of 1,160 to 1. Production is from 4,893 feet to 4,982 feet, having been plugged back from salt water at 5,162 feet. The well is 440 feet out of the southwest corner of Labor 53, League 40, Maverick County School Lands. Richardson plans to start another test in the new area on a Sun Oil Co. farm-out. The new operation will be the No. 1 Denton, about 4,000 feet north and 20 degrees west of the No. 1 Coe.

Two and one-half miles north of the discovery well in the Dean pool of Cochran County, T. G. Shaw No. 1 Carrie S. Dean, wildcat producer, reported a gauge of 285 bbls. of oil per day. The well is bottomed at 4,982 feet and has been acidized with 7,500 gallons in three treatments. It is located in the southwest corner of League 94, Mills County School Lands. On the eastern side of the Dean pool, Devonian Oil Co. staked location for No. 2-B-19 Duggan, Labor 19, League 55, Oldham County School Lands, 4,000 feet southeast of production. The test is between the pool proper and the Texas Co. No. 1 Boyd, recently completed for 236 bbls. of oil daily.

Stonewall County

W. I. Southern, Inc. No. 2 Carlisle, Section 293, Block D, Gibson Survey, quarter-mile northwest extension and second well for the Carlisle pool in northwestern Stonewall County, was reported to have flowed an average of 40 bbls. of oil daily on Railroad Commission gauge. Pay had been found from 5,147 feet to 5,153 feet, in the Palo Pinto lime. W. I. Southern, Inc., last December, absorbed the holdings of the Stonewall Oil Co., which drilled the discovery well on a 13,000-acre block. The pool is about 6 miles north of the town of Peacock.

Southern Basin Area

Sinclair Prairie Oil Co. No. 1 Fay Holt, Section 1, Block A, P.S.L. Survey, three-quarters mile west extension to the north end of the North Cowden pool of Ector County, was drilling below 4,282 feet in lime with 1,500 feet of oil in the hole. During a 24-hour period the well was reported to have headed 40 bbls. of oil. First pay of the well had been encountered from 4,165 feet to 4,185 feet, with an increase in oil from 4,186 feet to 4,207 feet.

Lease expiration is said to have caused the Magnolia Petroleum Co. to seek a 2-mile northwest extension to the Goldsmith pool of Ector County. The company has staked a location for its No. 1 TXL, SE cor. Section 9, Block 45, T.&P. Survey. The new location is a mile and a quarter southwest of a 25-bbl. producer by the Atlantic Refining Co. in the NW cor. Section 10.

WEST CENTRAL TEXAS

A new Ordovician oil pool for Stephens County was seen in Lone Star Gas Co. No. 1 J. S. McKee, Section 51, Block 7, T.&P. Survey. The test is a south offset to the G. W. Rich No. 1 Andrews, which was completed for a Lake sand well to give Stephens County a new pool last summer. The Lone Star test failed to find production in the Lake sand and was carried to the Ellenburger formation. The test topped the Ellenburger at 4,059 feet with saturation being drilled from 4,107 feet to 4,117 feet. The hole filled 1,500 feet with oil in three hours and was last reported heading oil at irregular intervals. The Lone Star Co. holds a large amount of acreage in the vicinity of the test.

Also in Stephens County, T. G. Shaw, who is completing a wildcat in Cochran County, West Texas, and drilling another in Howard County, staked location for No 1 S. P. Stroud, NW quarter of Section 127-A, G. Newton Survey, about 15 miles north of Caddo. The test is contracted to 4,200 feet and will test the Marble Falls lime expected at about 4,000 feet and the Ellenburger lime expected at about 4,200 feet.

In Callahan County, a shallow wildcat drilled by R. C. Silverthrone in the northwestern part of the county and on the J. M. Morrissett lands, was showing oil from saturated lime topped at 1,855 feet. Testing has been delayed due to cavings. Location is in Section 93, Block 14, T.&P. Survey, 5 miles northwest of Clyde.

Shackelford County

Half-mile northwest outpost to the Ivy pool of Shackelford County, the Owens-Snebold test in the McKeever lands, NE quarter of Section 158, B.B.B.&C. Survey, is hailed as the largest oil producer in the history of Shackelford County. The well drilled saturation in lime from 3,145 feet to 3,187 feet, and was reported to be more than 30 feet higher than other wells in the pool. Tanks have been erected and the well will be given an official gauge in the next few days. On initial tests the well was reported to have flowed at the rate of about 200 bbls. per hour.

Extension possibilities for the southwest side of the Cook pool, also in Shackelford County, were seen when Roeser & Pendleton, discoverers of the pool some 13 years ago, brought in their No. 29-A Cook for 132 bbls. of oil daily. The first well to be drilled on the southwest side of the pool in several years, the extension encountered 27 feet of oil sand topped at 1,340 feet. It is a quarter-mile south of the No. 1 Cook, which is still producing from the shallow sand.

Noodle Creek Pool

In the Noodle Creek pool of southwestern Jones County, where several deepening operations are under way to the Swastika sand horizon discovered last summer, the Texas Co. has completed its No. 4 W. E. Camp for 294 bbls. of oil daily. The well found 5 feet of saturation from 3,135-40 feet. Location is in Section 13, Block 19, T.&P. Survey. Several other tests in the field are preparing to deepen to this lower horizon.

WEST CENTRAL TEXAS COMPLETIONS

Brown County

Ferrell No. 1 Woods, dry and abandoned at 770 feet. Whitesides & Rogers No. 5 Newton, 1,207-15 feet, 30 bbls. Whitesides & Smith No. 1 Holloway & Mathews, 1,368-75 feet, 3,690,000 cu. ft. gas.

Callahan County

Alliance Oil No. 2 Cook, dry and abandoned at 796 feet. Johnson No. 4 Harris, dry and abandoned at 606 feet. Keough No. 1 Clark, dry and abandoned at 851 feet. Warren & Kleiner No. 4-A Clark, 733-44 feet, 30 bbls.

Jones County

Buffalo Oil Co. No. 1 Wood, dry and abandoned at 2,258 feet.

Shackelford County

Butler & Horne No. 1-B Nail, dry and abandoned at 1,092 feet. Evans & Christie No. 12 Jeter, 1,180-83 feet, 4 bbls. Keys & Reed No. 1 Alexander, dry and abandoned at 610 feet. Lee & Key No. 13 Diller Brothers, 527-30 feet, 8 bbls. Schkade & Wood No. 1 Schkade, 705-18 feet, 100,000 cu. ft. gas.

WEST TEXAS FIELD COMPLETIONS

(24-hour gauge)

Crane County

American Liberty Oil No. 7 Tubbs, 4,252-4,430 feet, 1,749 bbls. Great Western Production No. 1-B University, 3,294-3,417 feet, 127 bbls. Gulf Oil Corp. No. 16 Henderson, 3,520-25 feet, 8,091 bbls. Gulf Oil Corp. No. 25 Waddell, 3,517-18 feet, 15,999 bbls.

Ector County

Barnsdall Refining Co. No. 1 J. E. Parker, 4,075-4,230 feet, 606 bbls. Gulf Oil Corp. No. 163 Goldsmith, 4,128-85 feet, 5,112 bbls. Gulf Oil Corp. No. 165 Goldsmith, 4,120-90 feet, 2,370 bbls. Gulf Oil Corp. No. 166 Goldsmith, 4,132-4,200 feet, 1,560 bbls. Gulf Oil Corp. No. 167 Goldsmith, 4,138-4,220 feet, 700 bbls. Gulf Oil Corp. No. 168 Goldsmith, 4,144-4,210 feet, 1,903 bbls. Gulf Oil Corp. No. 169 Goldsmith, 4,130-4,281 feet, 388 bbls. Oil Well Drilling Co. No. 6-B Cowden, 4,110-4,278 feet, 67 bbls. Phillips-Pure No. 57 Cowden, 4,116-4,164 feet, 683 bbls. Sunray Oil Co. No. 8-D H. C. Foster, 4,150-4,254 feet, 420 bbls. Sunray Oil Co. No. 2-B J. E. Witcher, 4,100-4,296 feet, 800 bbls.

Hockley County

S. W. Richardson No. 1 Coe, 4,893-5,182 feet, 2,048 bbls.

Howard County

Eastland Oil Co. No. 3-B T. & P., 2,615-2,791 feet, 962 bbls.

Pecos County

Landreth Production Co. No. 2-H University, 1,621-24 feet, 878 bbls.

Ward County

Gulf Oil Corp. No. 120 Hutchins, 2,570-2,785 feet, 557 bbls. Luse & Ice No. 6 Brictson, 2,035-90 feet, 203 bbls. Sahara Oil Corp. No. 3 Winter-Garden, 1,764-1,900 feet, 412 bbls. Standard Oil Co. of Texas No. 11 L. Adams, 2,485-2,670 feet, 315 bbls. Western Well Service Co. No. 3 Lackland, 1,918-2,107 feet, 214 bbls.

Winkler County

Richardson Oils, Inc., No. 4-E Scarborough, 2,804-2,970 feet, 248 bbls.

Yoakum County

J. E. Mabee No. 5 Willard, 4,990-5,230 feet, 3,060 bbls. Tide Water Associated Oil No. 1 Herman Koontz,

(Continued on Page 126)

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Among the Drilling

ALLEN & MORRIS moved one of their rotaries to the active McCampbell field in Aransas and San Patricio counties, Texas, for Jones Drilling Co. No. 1 Conn Brown. In the Luby field, Nueces County, Seaboard Oil Co. No. 48 Luby is being completed through perforated casing at 5,349-52 feet, while in the La Rosa field, Refugio County, three operations are reported for the Coronado Corp.

CRON & GRACEY received contract from Continental Oil Co. for No. 1 Katherine Welder, a wildcat test 4½ miles southeast of Seadrift in Calhoun County, Texas. The test is in the Eusebio Hidalgo grant, and the hole is expected to be carried to a depth below 10,000 feet. In the Weser area, Goliad County, Martex Oil Co. No. 1 Albrecht is being completed through perforated casing at 5,200 feet.

HARRY L. EDWARDS DRILLING Co. has reached a depth of 4,700 feet on the company's wildcat in Lavaca County, Texas. Other operations are reported at the Fairbanks field for Kirby Petroleum Co. at the Dickinson field for Coast Petroleum Co. and at the League City field for Midstates Oil Co.

GLENN H. McCARTHY received contract from Midwest Royalty Co. for No. 1 Westmoreland Farms, a wildcat near Bellaire in Harris County, Texas. Contract depth is 9,000 feet.

HOUSH & THOMPSON staked location for a second test in the northwest Conroe area, Montgomery County, Texas, and drilling is expected to be started within the next week. The well is about a mile southwest of the discovery well, completed several weeks ago as a gas well.

GEORGE ECHOLS abandoned his No. 1 Beaumont Launch Club in the Lovells Lake area, Jefferson County, Texas, and the rig will be moved to the China area in Jefferson County where contract was received for a 7,500-foot hole to be drilled by Hebert & Smith on the Stella Turner lease in the J. Gerish Survey.

TWO STATES DRILLING CO., Dallas, Tex., has received contract for the drilling of a deep, 5,000-foot wildcat test in Haskell County, West Central Texas. Test will be for the Amerada Petroleum Corp. and will be its No. 1 Charles Kleiner, scheduled for immediate drilling. Location for the test was staked in the northeast corner of the J. M. Cass Survey No. 37. Test will be drilled with Amerada Petroleum Corp. tools and the rig has been shipped to Haskell, where it will be placed on location next week. The fact that the deep wildcat test is to be thoroughly checked was indicated in the assignment of 15 drillers, eight engineers, and two supervisors to the project.

RUTHERFORD DRILLING CO. has started drilling operations on a joint test with Royalty Oil & Gas Corp. in the Bonnieview field, Refugio County, Texas. The well is located on the M. L. Oppenheimer lease and is a north offset to No. 1 Neimann, the discovery well which was drilled by Barnsdall Oil Co. and Rutherford Drilling Co.

AL BUCHANAN DRILLING CO. received contract from Superior Oil Corp. of Oklahoma for No. 1 Mestena Oil & Gas Co., a semiwildcat north of the Alta Mesa field in Brooks County, Texas. In the East White Point field, San Patricio County, drilling was started on Shell Petroleum Corp. No. 5 W. E. Kirk.

GRACE & WOODS, Wichita Falls, Tex., contractors, are drilling water well and rigging up rotary equipment for the drilling of a 4,300-foot wildcat test in Montague County, North Texas. The test is Staley Oil Co. No. 1 Ed Nunnelly, on a 7,000-acre block in the U. S. Ussery Survey, Abstract 824, 3 miles southwest of the town of Montague.

RICHARDS & HOLLOWAY DRILLING CO., Tyler, Tex., is completing its No. 2 Cities Service-Tarkington, in the Flag Lake field of Henderson County, eastern Texas. The well is expected to gauge about 100 bbls. daily from the Woodbine sand encountered from 3,035 feet to 3,040 feet.

OLSON DRILLING CO., Tulsa, is starting a new wildcat test in Lea County, New Mexico, for Fred Turner, Jr., of Midland. It will be the operator's No. 1 Lea County State Bank, center of the SW SW Section 30-14s-38e, northeast of Lovington. It will be projected to 5,500 feet.

A. Z. SKEETERS, Kilgore, Tex., contractor, has received contract from Jim Parsons, Jefferson operator, for the drilling of his No. 1 Ney Estate, a wildcat in Marion County, eastern Texas. Location is about 3

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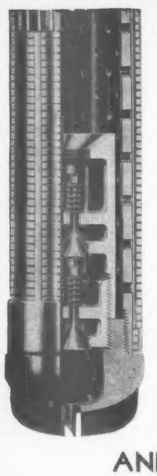
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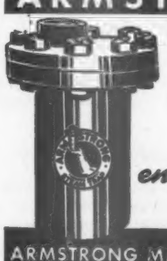
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Contractors

miles north of the main part of the W. A. Burton Survey. Contract depth is 2,600 feet and drilling will start immediately.

BROWN & NICHOLS DRILLING CO., Fort Worth, Tex., has staked location for its No. 1 Hoag, wildcat test 4 miles west of Jacksboro in Jack County, West Central Texas. Location is in the McKinney-Williams Survey, Abstract 436, and contract depth is 3,500 feet.

J. E. MABEE, Tulsa, has started work on an 80-acre farmout from Carter Oil Co. in the E half SE Section 23-4n-9e, Richland County, Illinois. This is in the double producing area that has attracted considerable attention around Olney. Carter retains an over-ride.

KINGWOOD OIL CO. and GEORGE BURGER have started up on their wildcat test in Section 2-7n-10e in Jasper County, Illinois. They have a large block of acreage in the vicinity.

HUGHES DRILLING CO. at No. 1 Meisner, Section 10-20-4w, Garfield County, Oklahoma, was rigging up rotary to rerun liner preparatory to drilling ahead. Total depth was 5,894 feet.

ENTERPRISE DRILLING CO. is drilling No. 1-A Wahl, in SE NW NW of Section 1-19n-25w, Ellis County, Kansas.

L. A. FARRIS and others No. 1 Purcell, in SE NE NW Section 33-19-9w, a mile to the northeast of the Chase pool of Rice County, Kansas, had the Arbuckle lime at 3,198 to 3,230 feet and filled up 1,400 feet with oil in eight hours. Treated first with 3,000 gallons of acid it pumped 27 bbls. of oil an hour.

ROBEY DRILLING CO. of Tulsa and Borah Brothers are drilling on their No. 1 Sol Whalin in Section 24-8n-9e in Jasper County, Illinois. It is on the eastern side of the basin and a short distance from the state's older fields.

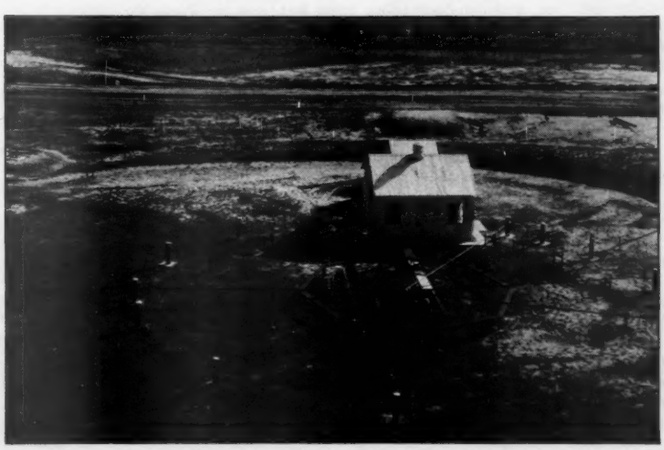
BIG CHIEF No. 1 Christian, Section 3-14-2, Lincoln County, Oklahoma, is drilling below 3,393 feet.

COOPER DRILLING CO. No. 4 School Land, Section 16-14-6, Lincoln County, Oklahoma, flowed 350 bbls. of oil in 24 hours at 3,125 feet. It then flowed 200 bbls. in 24 hours.

HELMERICH & PAYNE, INC., No. 3 Kenworthy, NE NW SW Section 14-14-6, Lincoln County, Oklahoma, at a total depth of 2,982 feet in sand was running packer and tubing to test.

OLSON DRILLING CO., Tulsa, has been drilling below 3,521 feet for Olson Oil Co. at No. 2 Osage (No. 1 L. Soldani), in NE Section 23-26n-4e, west of Burbank, in Osage County, Oklahoma. In the same area it is also drilling No. 3 Osage (No. 1 A. Soldani), in SE Section 14-26-4e, which is below 3,017 feet.

HARRY L. EDWARDS Drilling Co. completed Kirby Petroleum Co. No. 1 Daniel, an outpost test in the Goodykoontz area, Harris County, Texas, as a distillate producer. Casing was perforated at 7,203-11 feet, and the well is flowing into the pits through a quarter-inch choke, making an estimated 2,500,000 cu. ft. of gas and a show of distillate.



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By
NEIL WILLIAMS

Sparta-Wilcox Trend Draws Wildcatters and Lease Buyers

HOUSTON, Tex., Mar. 20.—A scheduled production test of a deep wildcat in Matagorda County, and the announcement of several important semi-wildcat locations near proven areas were the featured developments along the Texas coast, while in the Louisiana sector, new activity was reported on the Sparta-Wilcox trend and a new sand was being opened in the Creole field offshore from Cameron Parish in the Gulf of Mexico.

In the Buttermilk Slough area, west of the town of Palacios, Matagorda County, Sun Oil Co. was preparing to perforate casing in No. 1 Cavallin. The hole was drilled to a total depth of 9,582 feet, and 7-inch casing was cemented on bottom following the running of an electrical coring test. The only showing that has been reported was of gas and distillate in sand at 9,313 feet, and the well is reported to have attempted to blow out at that depth. The hole is bottomed in the Frio formation and the sand corresponds with that in the Palacios field, just north of the town of Palacios.

Magnolia Petroleum Co. has apparently extended the West Ranch field, Jackson County, 1,320 feet west, as casing was cemented in No. 9-A West. Oil sand was topped at 5,108 feet, and the section was cored to a total depth of 5,131 feet. Seven-inch casing was cemented at 5,121 feet.

Mills Bennett Production Co. and others No. 1 J. M. Truchard, Edward D. Corbitt Survey, Colorado County, one of the first Wilcox sand tests drilled on the west end of the Sparta-Wilcox trend, was abandoned at 6,900 feet after logging about 125 feet of sand with no showing of oil or gas.

On the southeast flank of the Esperson dome, Liberty County, General Crude Oil No. 1 Burgess, approximately 1 mile east of the same company's No. 1-B Esperson which was completed several weeks ago to open a new sand at approximately 7,300 feet, is drilling in shale below 8,100 feet, and no shows have been reported.

Caplen Discovery Tested

Sun Oil Co. No. 2 Cade, the discovery well of the Caplen field, located on Bolivar Peninsula, Galveston County, flowed 307 bbls. of 34-gravity oil daily on a 24-hour potential test. The well was tested through an 11/64-inch choke under a tubing pressure of 2,200 pounds. This well was drilled to a depth of 8,009 feet and was completed last week in the Frio formation at 7,474-78 feet. It is located in the A. Dickson Survey, and is the fourth well drilled on the prospect.

Shell Petroleum Corp. No. 1 F. L. Doucette, a south offset to Peyton Brothers No. 1-C Kirby West, the discovery well of Wilcox (Tertiary) production in the Ace field, Polk County, is coring below 7,923 feet and has failed to log any encouraging showings. Several drill-stem tests were reported to have been made in the Wilcox section below 7,800 feet, but recovered only a small amount of working pressure, gas-cut drilling mud and salt water.

League City Field

Operators in the League City field, Galveston County, were watching the progress of Phillips Petroleum Co. No. 1 Stewart Title Guaranty Co. which is reported to have cored sand with an oil odor in a new horizon at 10,313-22 feet, and the well is being cored deeper. Phillips Petroleum Co. No. 1 J. C. Ott, a north offset to the discovery well, is being killed to retest at a higher level after the well flowed 15 bbls. of fluid per hour of which 90 per cent was oil and the balance salt water. The same company's No. 1 Dr. Patton, an outpost, northeast of production, was placed on gas lift and is flowing 20 bbls. of fluid per hour of which 98 per cent is salt water and the balance oil. The casing was recently perforated at 9,180-83 feet.

In the Lovells Lake field, Jefferson County, George Echols No. 1 Beaumont Launch Club was abandoned at 7,750 feet A gas sand was cored at 7,667-7,715 feet, and salt water sand was topped at 7,727 feet. The well is an east offset to Shell Petroleum Corp. No. 1 Pleasant, a distillate producer. In the north extension area, Humble Oil & Refining Co. is testing two wells. No. 3 Jefferson Land Co. topped gas sand at 7,701 feet, oil sand at 7,714 feet and the hole is bottomed at 7,723 feet with 7-inch casing cemented at 7,722 feet. No. 1 Pitre topped gas sand at 7,699 feet, oil sand at 7,714 feet and 5½-inch casing was cemented on bottom at 7,723 feet. Locations were made for No. 2 Margaret Todd, William Carr Survey, and for No. 2 Broussard Trust in the C. Hillebrandt Survey.

In the Bammel field, Harris County, H. M. Harrell and others No. 1-A Ehrhardt, northwest of production in the George Delesdenier Survey, was drilled to a total depth of 6,956 feet and a drill-stem test was being made of sand at 6,180-83 feet, which was logged by an electrical survey. The Eponides Yeguaensis was topped at 6,487 feet.

Location for a second well in the Northwest Conroe field, Montgomery County, was made by Housh & Thompson. The well is to be drilled on the Graham lease in the Mary Corner Survey about 1 mile southwest of the discovery well. Although the discovery well was completed as a gas well in the Cockfield formation, it flowed pipe line oil for several days. Should the second well fail to find saturation in the Cockfield it is expected to be carried to the Wilcox sand.

New Pay in Fairbanks?

In the Goodykoontz area, northeast of the Fairbanks field, Harris County, Union Production Co. was completing No. 1 Murphy which is expected to add a new horizon in that area. Casing was cemented on bottom at 7,324 feet, and perforated opposite sand at 7,009-28 feet where a recent drill-stem test showed several hundred feet of pipe line oil. Northeast of this test about 1 mile, Kirby Petroleum Co. was reperforating casing for another test in No. 1 Daniels after it showed gas and distillate at 7,002-23½ feet.

Southwest of the above field and a half mile north of the Satsuma field, William & Gillespie No. 1 Behne flowed 382 bbls. per day through a quarter-inch choke on a potential test. Offsetting the well to the north, Moore & Ahern and others spudded No. 1 S. R. Zagist located in the Francis Fry Survey.

The deep pay in the Port Neches field, Orange County, was extended about 1,900 feet west as Texas Co. completed No. 13 Kuhn. The sand section was topped at 5,833 feet and the well was completed at a total depth of 5,975 feet for an initial production of 183 bbls. daily, flowing through a five-sixteenths inch choke.

Location for a Frio test was made 2 miles west of China in Jefferson County by Hebert & Smith on the Stella Turner lease in the J. Gerish Survey. In Brazoria County, and about 4,000 feet southeast of production in the Hastings field, Humble Oil & Refining Co. staked location for No. 1 H. L. Beech in the B.S.&F. Survey. In Harris County, one-half mile southwest of the Mykawa field, Sam H. Harrison started drilling No. 1 Minnetex in the William Lovett Survey. The well will be drilled to the Frio formation and is on a farmout lease from Stanolind Oil & Gas Co.

South Louisiana

The Sparta-Wilcox trend in the Louisiana sector of the Gulf Coast district continues to remain in the limelight as locations for four more wildcats were announced.

In the Merryville area, Beauregard Parish, Atlantic Refining Co. is building road to its third test on its block of 6,000 acres, No. 1-A Rice Land & Lumber Co., C NE SE NE Section 22-3s-11w.

Approximately 10 miles south of DeRidder, in the Bannister area, Beauregard Parish, Standard Oil Co. of California staked location for No. 1 Long Bell Lumber Co. in Section 23-4s-9w. The company has done considerable geophysical work in the area and two blocks are reported to have been leased.

In the northern part of Rapides Parish, Lyons & Neely made location for No. 1 W. P. Aertker in C NE SW Section 16-4n-1e, while northeast of the Cheneyville field in Section 4-1s-2e, Texas Canadian Oil Co. has rigged up for No. 1 Myrtle B. Pope.

Geophysical Crews Busy

Approximately 25 geophysical crews are located in the northern tier of parishes which is receiving an extensive leasing campaign. Recent blocks acquired in the district include Sun Oil Co.'s block of 8,000 acres centering around Section 10-1n-8e in Concordia Parish. In the same parish and centering in Section 34-3n-8e. Texas Co. is reported to have leased approximately 5,000 acres. Other blocks are reported to have been taken by Gulf Oil Corp. and Magnolia Petroleum Co.

In the Eola field, Avoyelles Parish, the discovery of which resulted in the present wildcatting and leasing program, Sid Richardson has two wells coring in the Tertiary Wilcox sand. No. 2 Haas Investment Co., northeast of the discovery well, is coring in shale below 8,632 feet in an attempt to establish the water level. The Wilcox sand was cored at 8,448-8,561 feet. No. 3 Haas Investment Co. topped the Wilcox at 8,469 feet and is coring in sand and shale below 8,506 feet. Both wells are reported to have topped the section a few feet lower than the discovery well. The same operator staked location for No. 1 State Bayou, midway between the above wells.

On the northwest side of the Villa Platte field, Evangeline Parish, Continental Oil Co. No. 1 Tate, Section 45, showed gas in the Haas sand and is drilling in shale below 9,250 feet. Production in this field is developed from the Sparta sand, and the well is being drilled deeper in hopes of finding saturation in the Wilcox formation.

In the Creole field, offshore from Cameron Parish in the Gulf of Mexico, Superior Oil Co. No. 5 State-Gulf of Mexico is flowing gas and distillate through perforated casing at 6,847-54 feet to open a new sand for the field. The hole is bottomed at 7,192 feet and 5½-inch casing was cemented at 6,951 feet. The new sand is approximately 1,600 feet deeper than the discovery horizon at 3,200 feet from which four wells have been completed.

Location for another test in the Chalkley field, Cameron Parish, was made by Humble Oil & Refining Co. for No. 2 Sweet Lake Land & Oil Co. in Section 8-12s-6w. The location is about a mile northwest of the company's No. 2 Cameron Parish School Land which is drilling below 8,700 feet. Shell Petroleum Corp. has staked location for another test, but actual foot measurements were not available at the close of the week.

TEXAS GULF COAST COMPLETIONS IN PROVEN FIELDS

Brazoria County

Manvel field: Texas Co. No. 20-A W. T. Belcher, plugged back depth 4,063 feet, gas well. West Columbia field: Texas Co. No. 31 W. H. Abrams, sand 5,615-65 feet, 431 bbls., quarter-inch choke.

Galveston County

Caplen field: Sun Oil Co. No. 2 Cade, perforated casing 7,474-78 feet, 307 bbls., 11/64-inch choke. Dick-

(Continued on Page 146)

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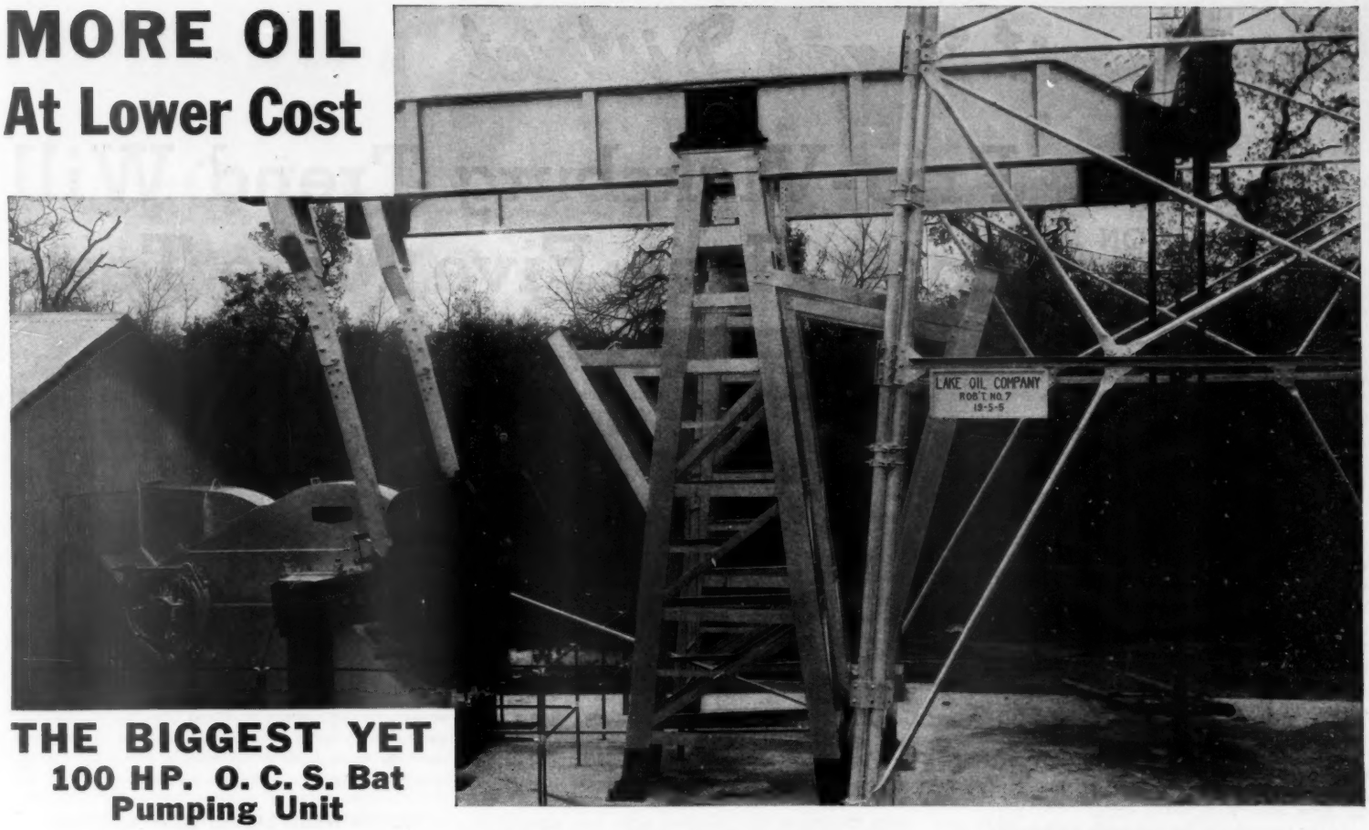

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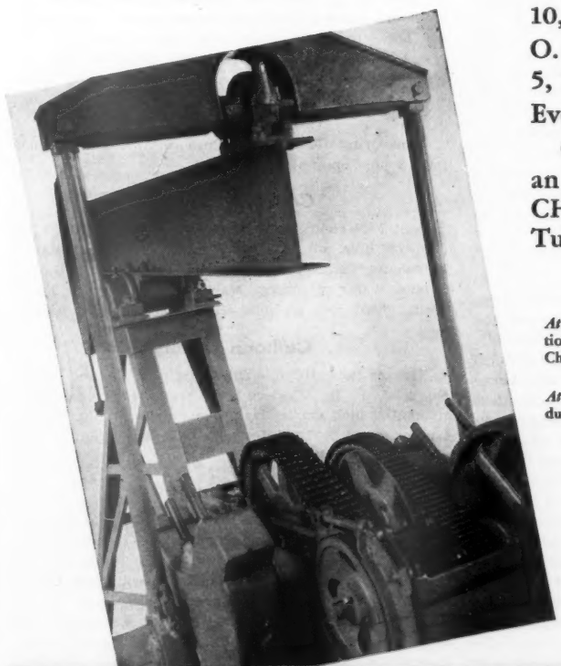
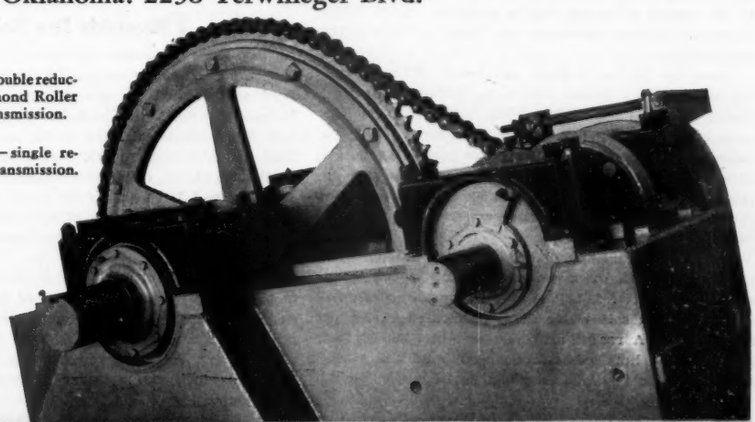


At left—double reduction Diamond Roller Chain transmission.

At right—single reduction transmission.



DIAMOND ROLLER CHAIN

Southwest Texas District

By
F. L. SINGLETON

Frio-Vicksburg Trend Will Soon Have Five More Tests

CORPUS CHRISTI, Tex., Mar. 20.—An increase in wildcat operations along the highly regarded Frio-Vicksburg trend, and the opening of the first oil production in the Bird Island field in Laguna Madre Bay offshore from Kleberg County held the attention of operators in the Southwest Texas district the past week.

Locations made for five Frio-Vicksburg tests in Jim Wells County continue to make this sector the most active wildcat area in the district. North of Alice in the La Tinaja de Lara grant, Texas Gulf Production Co. is moving in material for No. 1 A. M. Perez. Pan American Production Co. and Southern Minerals Corp. contributed acreage toward the drilling of the well, which will be carried to a depth of approximately 6,000 feet. Northeast of Alice, Ike Howeth is rigging up No. 1 O. S. Adams in Section 122, William Adams Survey.

Approximately 4,000 feet west of the southern part of the South Alice field, H. H. Howell has started drilling No. 1 Charles Muil, in Lot 66, L. G. Collins Farm Lots. Two miles northeast of Orange Grove in the Juan Jose de la Garza grant, Tom Davey made tentative location for No. 1 Joseph Boehm, while east of Alice in the Los Presnos grant, Subdivision 3, C. Matlock staked location for No. 1 J. V. Vandenberge.

While preliminary work was being started on the above locations, production tests were being made at two other wildcat operations. Tom Graham No. 1 N. O. Adams, Marcellino Lopez grant, cemented 4½-inch casing at 5,020 feet and was scheduled to test sand at 4,928-38 feet, which showed favorably on an electrical survey. This well is about a mile east of Gravis & Doran No. 1 Frances Clark, which opened distillate production 2½ miles southeast of the South Alice field. The latter well was completed through perforated casing at 4,805-14 feet, and is flowing gas and distillate through a 9/64-inch choke under a tubing pressure of 250 pounds and casing pressure of 275 pounds.

Salt Water in La Gloria Test

In the southern part of the county and near La Gloria townsite, Magnolia Petroleum Co. No. 1 Sam Maun was shut down after testing dry on a drill-stem test through perforated casing at 6,560-70 feet. This is the second drill-stem test, a previous one at 7,095-7,110 feet having developed salt water, with a slight show of gas.

Pure Oil Co. No. 1 State, northwest of the discovery well and the second well to be drilled in the Bird Island field in Laguna Madre Bay, offshore from Kleberg County, flowed 68 bbls. of 44-gravity oil on a 24-hour potential test. The well was tested through a 14/64-inch choke. Working pressure on the tubing ranged from 2,325 pounds to 2,500 pounds. Production is from the Marginulina-Frio sand through perforated casing at 7,235-47 feet.

Prospect of marking up an important extension to the Sweden field, Duval County, was not encouraging as Frank Gravis No. 1 Parr, 1 mile northeast of production, tested salt water from perforated casing at 5,865-75 feet. A recent drill-stem test at 5,860-90 feet tested several hundred feet of gas-cut mud and a second production test was scheduled to be made.

New Work in Duval

Locations for five wildcats were reported in Duval County the past week, some of which are located on the Cockfield trend in the eastern half of the county and others in the west half of the county along the shallow Laredo-Pettus trend. Southwest of San Diego, Arkansas Fuel Oil Co. and Taylor Refining Co. spudded No. 1 Lillian Parr in the P. Seanz Survey No. 12. Southwest of the Benavides field in Section 7, Ball Ranch subdivision of the Santos Flores grant, Henderson Coquat and others started drilling No. 1 Southland Life Insurance Co. The well is about 1½ miles southwest of production. North of the town of Hebronville, Texas Gulf Production Co. staked location for No. 1 John Dunn in Section 378 of the Diego Hinojosa Survey. Southeast of Freer, J. Poitevent Survey No. 550, Republic Production Co. made location for No. 1 Society for the Propagation of the Faith. In the Laredo area and located 1½ miles north of the Casa Blanca field, Transwestern Oil Co. was scheduled to start drilling No. 19 Duval County Ranch Co. in the P. Martinez Survey.

Humble Oil & Refining Co. No. 5 McGill Brothers, an outpost in the Brooks County side of the Kelsey field, is drilling below 5,350 feet. A 25-minute drill-stem test at 5,350-57 feet developed 30 feet of drilling mud, cut with gas, and 75 pounds of working pressure. This well is believed to have defined the east side of the field in view of the fact that only slight showings were logged in the discovery horizon at 4,600-4,900 feet. The same company No. 1 Mestena Oil & Gas Co., a wildcat located across the line in Jim Hogg County, is shut down at 5,342 feet, after a 25-minute drill-stem test at 5,153-60 feet tested 31 feet of gas-cut drilling mud, with a steady blow of gas. Several showings have been reported in the Frio-Vicksburg section at intervals from 4,800 feet to the present depth, but none of the showings was significant enough to warrant setting casing.

Along this same trend and in the La Sal Vieja area, Willacy County, Cockburn and others No. 1 Yturria Land & Cattle Co. is drilling in shale below 6,274 feet, and continues to attract attention as broken sand and shale sections carrying oil and gas showings are logged. A three-minute drill-stem test at 4,843-71 feet developed 155 feet of drilling mud, cut with gas, while a 15-minute test at 4,867-4,910 feet, brought up 110 feet of mud, cut with oil and gas. The main sand, from which Shell Petroleum Co. No. 1 Yturria Land & Cattle Co., the discovery well, was completed as a distillate producer, is expected below 7,000 feet.

In the Weser area, Goliad County, Martex Oil Co. No. 1 W. F. Albrecht, Thomas Hancock Survey, cemented casing on bottom at 5,312 feet, and is testing through perforated casing at 5,230-38 feet.

2 Riverside Dry Holes

Two more dry holes were marked up for the Riverside field, Nueces County. Two miles north of the field and located in San Patricio County, Republic Natural Gas Co. No. 1 Crockett was abandoned at 5,525 feet. The well is reported to be about 93 feet lower than Shell Petroleum Co. No. 1 Griffin, 1,200 feet northwest of the discovery well, which is drilling in shale below 6,140 feet, several hundred feet below the discovery horizon. South of the field about a half mile, Heep Oil Corp. and others abandoned No. 1 G. W. Smith at 6,501 feet.

Morgan Gulf Oil Corp. No. 1 Birdie Rooke, located in the southwest extension area of the La Rosa field, Refugio County, has been completed as a distillate producer in a new sand at 5,850-55 feet. At the close of the week the well was flowing through a three-sixteenths inch choke under a working pressure of 1,760 pounds.

In the same county and located in the Bonnieview field, Royal Oil & Gas Corp. and others started drilling No. 1 M. L. Oppenheimer, located in the Antonio de la Vina Survey. The well is a north offset to Barnsdall Oil Co. and others No. 1 Neimann, the discovery well, which was completed as a distillate producer several weeks ago.

Location for an important south outpost test to the newly-opened Mellon Creek field, Refugio County, was made by Quintana Petroleum Co. for No. 3-B O'Connor in the Timothy Hoyt Survey, about 5,800 feet due south of Copano Oil Co. No. 1-C Thomas O'Connor, the discovery well.

As production was extended within 600 feet of the Aransas Pass city limits in the south end of the McCampbell field in Aransas and San Patricio counties, drilling operations were started on the first test within the city limits. Rantex Oil Co. No. 1 Walker-McCarthy, 600 feet from the townsite, was being completed for a producer through perforated casing at 7,126-32 feet. In Lot 5, Block 213 of the Aransas Pass city townsite, R. B. Bryant started drilling operations on the No. 1 Losoya. Conn Brown, independent operator of San Antonio, who held 18 permits to drill within the city limits, is reported to have made a deal with Corgey & Grote to drill his permits. The first well is to be drilled before May 1, and the drilling of an offset will be required every 30 days. Of the 71 permits granted by the city commissioners to date, 44 are held by Corgey & Grote, and 13 more permits have been requested by various operators.

SOUTHWEST TEXAS COMPLETIONS IN PROVEN FIELDS

Aransas-San Patricio Counties

McCampbell field: Landrum & Jones Oil Co. No. 1 Dixon, perforated casing 7,125-32 feet, 95 bbls., one-eighth inch choke. Mortex Oil Corp. No. 1 Duphrone and Anderson, perforated casing 7,201-05 feet, 120 bbls., one-eighth inch choke. J. P. Nash No. 2 Young and Henderson perforated casing 7,114-19 feet, 65 bbls., 9/64-inch choke. Richardson Petroleum Co. No. 2 Cotter and Ayers, 7,209 feet, abandoned. Richardson Petroleum Co. No. 2 Mills, perforated casing 7,134-37 feet, 200 bbls., three-sixteenths inch choke. Shasta Oil Co. No. 1 Windsor perforated casing 6,862-72 feet, 110 bbls., one-eighth inch choke.

Bexar County

Von Ormy field: Roger Putnam No. 14 Wetz, 659 feet, 3 bbls., pumping.

Caldwell County

Salt Flat field: H. H. Coffield No. 3-A Smith, 2,708 feet, 50 bbls. oil, 283 bbls. water, pumping. Martel Petroleum Co. No. 4 Carter, 2,671 feet, 75 bbls. oil, 9 bbls. water, pumping. Martel Petroleum Co. No. 2 Smith, 2,697 feet, 60 bbls. oil, 7 bbls. water, pumping.

Calhoun County

Heyser field: Humble Oil & Refining Co. and others No. 26-A P. H. Welder, 5,477 feet, 312 bbls., three-sixteenths inch choke. Magnolia Petroleum Co. No. 13 Lander, sand 5,472-84 feet, 35 bbls. oil 8 hours, one-eighth inch choke.

Duval County

Benavides field: Hiawatha Oil & Gas Co. No. 23 Parr, sand 5,480-86 feet, 96 bbls., 5/32-inch choke. Colmena field: Colmena Oil Co. No. 1 Duval County Ranch Co., 1,600 feet, abandoned. Driscoll field: Continental Oil Co. No. 33-A Driscoll, perforated casing 3,348-80 feet, 29 bbls., quarter-inch choke. Eagle Hill field: Magnolia Petroleum Co. No. 19 Duval County Ranch Co., sand 1,453-64 feet, 100 bbls., pumping. Fitzsimmons field: Sun Oil Co. No. 9 Brueggemann, perforated casing 4,330-35 feet, 66 bbls., 14 hours, one-eighth inch choke. Hoffman field: Magnolia Petroleum Co. No. 28 Weil, sand 2,704-08 feet, 144 bbls., jetting with gas. Lundell field: Humble Oil & Refining Co., No. 12-B White, perforated casing 1,159-22 feet, 4 bbls., pumping. Humble Oil & Refining Co.

(Continued on Page 130)

California Field Report

By
L. P. STOCKMAN

Continental's Second Wasco Well Good for 9,200 Barrels

LOS ANGELES, Calif., Mar. 20.—Continental Oil Co. completed an excellent well in the Wasco field, Kern County, when No. 4-A Kern County Land in Section 8-27-24 was brought in flowing 4,650 bbls. of 36.8-gravity oil and 2,150,000 cu. ft. of gas per day from a depth of 13,154 feet, through a 56/64-inch bean. The well showed a tubing pressure of 1,150 pounds and a casing pressure of 1,300 pounds. It has been given a calculated potential of 9,200 bbls. per day. No potential test was made due to limited trap capacity which permitted an actual flow of only 4,650 bbls. per day. Top of the oil sand was logged at 13,106 feet and the well has an elevation of 285 feet above sea level. This is Continental's second completion in the Wasco field, which is by far California's deepest productive field at present. The production parallels that of Standard Oil Co.'s first completion in this field several months ago and indicates that Wasco may become of first importance from a production standpoint, especially as a second and deeper productive zone was found by Continental Oil Co. in its discovery well. Drilling operations have been concentrated in a rather limited area, so no estimate can be made with respect to the probable number of acres that may be found productive. It appears probable that Standard Oil Co. will ultimately be found to control the largest amount of productive acreage. No. 2 Mushrush, which Standard Oil Co. is drilling, has reached a depth of 13,124 feet in an oil sand of good saturation and should be ready for a production test within a week. This well will extend the productive limits to the west if commercial production is developed. The next well to be finished after completion of No. 2 Mushrush should be Standard No. 8-2-B Kern County Land in Section 17-27-24, last reported at 10,990 feet.

Wilmington

In the Wilmington field of Los Angeles Basin A. Haines completed No. 1 Harbor, flowing 237 bbls. of 18.2-gravity oil per day from the Ranger zone with bottom of the hole at 3,047 feet. Royalty Service Corp. No. 8-A Nelson was carried down to the Ford zone and finished at 5,665 feet, flowing 145 bbls. of 28.8-gravity oil per day through a 24/64-inch bean. This well, in the west end of the Wilmington field, secured normal production from the Ford zone as this horizon has not shown much kick west of the Ford fault. No. 8-A Nelson was finished with a string of 7-inch casing including 85 feet of 80-mesh perforations landed on bottom and cemented through perforations at 5,565 feet.

The Long Beach Harbor Commission, which originally awarded a contract to Ramsey Petroleum Corp. for development of 269 acres of tideland in the Long Beach section of the Wilmington field and then canceled the agreement, has now made a deal with Long Beach Oil Development Co. for development of the same property. The Ramsey interests have instituted suit against the Harbor Commission. The new contract with Long Beach Oil Development Co. provides that this company will receive 14.45 per cent of the gross amount of oil and natural gas produced and that the city of Long Beach through the Harbor Commission will receive 30 per cent of production. Drilling expenses will be deducted from the remaining 54.55 per cent and after the cost of development has been returned the municipality will receive 65.99 per cent, the operator 14.45 per cent, 19.56 per cent representing production costs. This development agreement was approved by the Harbor Commission last week and will be signed within the next few days. The Ramsey bid for the same property was 60.25 per cent to the city of Long Beach and was the highest bid at the time the original offer was made.

TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS

	March 11		March 4			
	Total this week	Daily average	Total last week	Daily average	This year to date	Same time last year
Intercoastal-domestic—						
Crude oil	.....	.....	.....	.....	60,642	.....
Fuel oil	.....	.....	.....	.....	324,591	.....
Diesel and gas oil	.....	.....	.....	.....	163,501	.....
Gasoline	106,840	15,263	.....	.....	302,594	461,469
Kerosene	.....	.....	.....	.....	56,940	132,575
Foreign exports—						
Crude oil	230,123	32,875	440,812	62,973	2,948,789	4,481,797
Fuel oil	61,892	8,842	218,835	31,262	1,363,687	1,458,558
Diesel and gas oil	79,763	11,395	84,223	12,032	772,003	938,425
Gasoline	109,596	15,657	113,235	16,176	1,700,151	1,026,079
Kerosene	17,046	2,435	.....	.....	234,289	168,453
Coastwise-domestic—						
Crude oil	436,130	62,304	115,701	16,529	1,883,162	2,062,061
Fuel oil	180,505	25,786	107,659	15,380	1,740,405	2,619,865
Diesel and gas oil	29,605	4,229	92,735	13,248	564,165	305,323
Gasoline	102,961	14,709	319,335	45,619	2,255,416	2,765,187
Kerosene	18,114	2,588	21,542	3,077	76,948	42,756

TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic—						
Diesel and gas oil	.....	.....	.....	.....	69,550	178,662
Asphalt	.....	.....	.....	.....	.....	73,449
Lubricants	.....	.....	.....	.....	4,170	.....
Foreign exports—						
Crude oil	.....	.....	127,529	18,218	918,258	760,177
Fuel oil	.....	.....	83,902	11,986	344,717	256,214
Diesel and gas oil	.....	.....	186,888	26,698	306,306	181,973
Gasoline	.....	.....	15,590	2,227	610,230	878,417
Kerosene	.....	.....	9,810	1,401	148,834	110,450
Lubricants	.....	.....	29,945	4,278	84,271	82,632
Coastwise-domestic—						
Fuel oil	170,213	24,316	168,114	24,016	1,030,592	1,308,459
Diesel and gas oil	45,902	6,557	.....	.....	87,454	351,406
Gasoline	212,937	30,420	84,153	12,022	694,173	1,311,924
Kerosene	32,311	4,616	9,137	1,305	109,754	175,083

TOTAL TANKER SHIPMENTS FROM CALIFORNIA TO DOMESTIC AND FOREIGN PORTS

Intercoastal-domestic—						
Crude oil	.....	.....	.....	.....	60,642	.....
Fuel oil	.....	.....	.....	.....	324,591	.....
Diesel and gas oil	.....	.....	.....	.....	233,051	178,662
Gasoline	106,840	15,263	.....	.....	302,594	461,496
Kerosene	.....	.....	.....	.....	56,940	132,575
Asphalt	.....	.....	.....	.....	.....	73,449
Lubricants	.....	.....	.....	.....	4,170	.....
Foreign exports—						
Crude oil	230,123	32,875	568,341	81,192	3,867,047	5,241,974
Fuel oil	61,892	8,842	302,737	43,248	1,708,404	1,714,772
Diesel and gas oil	79,763	11,395	271,111	38,730	1,078,309	1,120,398
Gasoline	109,596	15,657	128,825	18,404	2,310,381	1,904,496
Kerosene	17,046	2,435	9,810	1,401	383,123	278,903
Lubricants	.....	.....	29,945	4,278	84,271	82,632
Coastwise-domestic—						
Crude oil	436,130	62,304	115,701	16,529	1,883,162	2,062,061
Fuel oil	350,718	50,103	275,773	39,396	2,770,997	3,928,324
Diesel and gas oil	75,507	10,787	92,735	13,248	651,619	656,729
Gasoline	315,898	45,128	403,488	57,641	2,949,589	4,077,111
Kerosene	50,425	7,204	30,679	4,411	186,702	217,839

The tideland property in question consists of 269 acres and lies on both sides of the harbor ship channel, extending from the westerly city limits and along the ocean front to the flood control. This is one of the choicest undrilled properties in the Wilmington field, as it should have a large drainage area as a portion of the productive zone in the Wilmington field extends out into the ocean. Conservative estimates indicate minimum of 25,000,000 bbls. of crude oil should be produced as a result of this development. The agreement to be signed by the city of Long Beach with the Long Beach Oil Development Co. stipulates that the latter must start drilling within 48 hours after signature and keep 12 strings of tools in operation until a minimum of 74 wells or a maximum of 108 wells shall have been drilled. This means that upon conclusion of development work the city of Long Beach will have an interest in more than 150 wells in the Long Beach section of the Wilmington field as Signal Oil & Gas Co. is at present working on a contract that provides for the drilling of about 75 wells. This development may hamper curtailment or at least make it difficult to reduce field production to its fair share of the state's output although the company is well financed and expects a long pay-out. The Long Beach Oil Development Co., although no announcement has been made, is believed to consist of Standard Oil Co., Hancock Oil Co., A. N. Macrate, Signal Oil & Gas Co., Apex Petroleum Corp. and Termo Oil Co. Its officers are Will J. Reid, president; Howard Marshall, vice president; John Hancock, vice president; Harry March, secretary, and George Schroeder, assistant secretary. Will J. Reid is president of Hancock Oil Co. and Howard Marshall is legal representative of Standard Oil Co.

Coles Levee

Union Oil Co. is expected to extend the productive limits of the Coles Levee field of Kern County when a production test is made of No. 1-11 Kern County Land, an outpost in Section 11-31-25. This field was discovered by Ohio Oil Co. late last year by completing No. 1-F Kern County Land in Section 10-31-25. Late in the week Union Oil Co. made a formation test at 9,630 feet with bottomed of the hole at 9,685 feet, and the well showed a strong steady blow of gas and oil for 90 minutes with the tester open for two hours. It is estimated that the well blew at the rate of 7,500,000 cu. ft. of gas and about 500 bbls. of 32.5-gravity oil per day during the period of the test. Flow pressure ranged from 1,300 pounds to 2,000 pounds. It is the intention to core ahead before landing pipe in order to open up additional oil sand. The well is east of Ohio Oil Co.'s acreage in Section 10-31-25. Standard Oil Co. No. 20-1 Kern County Land in Section 9-31-25 is at a total depth of 8,390 feet, but is temporarily held up with a fishing job. Tide Water Associated Oil Co. has a rig up southeast of Ohio's discovery well and south of Union's No. 1-11 Kern County Land. In the meantime Ohio Oil Co. has concluded drilling on

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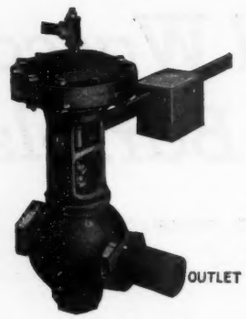

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No. 2-F Kern County Land in Section 10-31-25 at 9,653 feet and has landed a string of 7-inch casing preparatory to an early production test.

Montebello Extension

In the western extension of the Montebello field Herley Kelly, Inc., completed No. 2 Burke Community flowing 585 bbls. of clean 20.1-gravity oil per day through a 40/64-inch bean from the seventh zone with bottom of the hole at 7,230 feet. This well, which shows a tubing pressure of 750 pounds and a casing pressure of 1,250 pounds, was carried deeper into the seventh zone than any well tested heretofore as it has a penetration of 295 feet. The well was finished with 620 feet of 6⅝-inch liner including 295 feet of perforated landed on bottom and cemented through perforations at 6,935 feet. It has an extremely high gas-oil ratio and hence some action may be taken by state authorities on the assumption that this constitutes underground waste which, likewise with surface waste, is prohibited by the California gas conservation law which has been enforced only at infrequent intervals. Completion of this well, which was originally finished in the upper zone, is of special interest because if it is permitted to produce from the seventh zone it will mean that this zone will be thrown open for development despite attempts to hold it back until next year in the hope that conditions might improve sufficient to absorb the resulting production without disrupting the crude oil market. Standard Oil Co. has completed a new derrick for No. 6 Whitehead, an offset to No. 2 Newmark of Pongratz Oil Co., which is now producing 225 bbls. of 36.4-gravity oil daily from the lower member of the sixth zone at 6,710 feet. Union Oil Co. was rotating in No. 30 La Merced and late in the week had reached a depth of 7,920 feet. This well is believed to be definitely below the seventh zone but has not found any additional oil sand in addition to that cored at 7,500 feet. It is believed probable that this zone is capable of yielding commercial production in the upper part of the horizon. On a formation test last week at 7,654-7,778 feet the well showed water and oil, but was definitely "wet."

Torrance

Daily production of the Lomita, Eshelman and Walnut sections of the Torrance field has been showing a consistent decline during the past two weeks. The Lomita section of the field reached the bottom last year but the Eshelman and Walnut sections took up where Lomita left off with the result that field production early this year was larger than last when the Lomita area was undergoing deep-zone development. Recent completions in the Eshelman and Walnut areas have been growing smaller and smaller with now and then a good well. In addition to the decline in production the water cut has been increasing, indicating the advent of smaller production.

During the past week three wells were put on production in the Torrance field and one in the Harbor City field, south of the eastern end of Torrance. At Harbor City, Texas Co. completed No. 4 Oakley flowing 265 bbls. of 29.2-gravity oil cutting 3 per cent from 5,200 feet. This well, at Lomita and Vermont avenues, was brought in flowing through a 76/64-inch bean and the initial daily production therefore represents about the well's maximum potential. In the Walnut section of the Torrance field, Vesta Oil Co. completed No. 1 Bruhn at 257th and Walnut streets flowing 435 bbls. of clean 26.3-gravity oil per day from the deep zone with bottom of the hole at 5,171 feet. In the older section of the Torrance field Woolner Oil Co. recompleted No. 7 fee flowing 220 bbls. of 25.9-gravity oil cutting 5 per cent. This well was carried down to 5,140 feet. W. A. Kirk No. 9 Lomita has been recompleted pumping 110 bbls. of 26.1-gravity oil cutting 16 per cent from 5,095 feet.

In the Huntington Beach field Southwest Exploration Co. completed No. 9 State pumping 312 bbls. of clean 22.8-gravity oil per day from the tideland accumulation with bottom of the hole at 4,375 feet.

Coastal Area

In the Santa Maria Valley field in the coastal section of the state in Santa Barbara County George F. Getty, Inc., No. 8 Vicente and E. H. Moore, Inc., No. 11 Union Sugar were given production tests. The former was completed flowing 2,500 bbls. of clean 16.3-gravity oil per day from 4,982 feet, and the latter was brought in flowing 390 bbls. of clean 16.3-gravity

(Continued on Page 135)

Oklahoma Operations

By DAL DALRYMPLE

Wilcox Production Is Goal of Three Wildcats Near Garber

Wildcat exploration in Oklahoma continues to increase, several new tests in unproven areas being announced the past week, with the bulk of the activity in western and southern counties.

Deep sand production is the goal of three wildcats on the west and southwest flanks of the Garber field in Garfield County. Kerlyn Oil Co. and others staked location and were due to begin work right away at a location in NW NW NW Section 36-22-4w, with Wilcox sand as the objective. About 1¼ miles southwestward, Continental Oil Co. No. 1 Luedeman, C SW NE Section 2-21-4w, had set surface casing, and slightly more than 1 mile north of the Kerlyn location Sinclair Prairie Oil Co. No. 4 Harris, C SE SE Section 23-22-4w, was reported drilling below 2,300 feet. Geologists believe that structural conditions in the area around these wildcats are similar to that of the Oklahoma City and Billings fields, where big Wilcox sand production was fcund.

Paul Helf of Tipton, Okla., was digging cellar and pits and moving in derrick at No. 1 Brissley, NE NE NE Section 22-1s-19w, in western Tillman County. Drilling was scheduled to be started this week.

Continental Oil Co. No. 1 Proctor, C NW Section 28-10-20w, on a big block southeast of Elk City but in Washita County, was drilling below 10,474 feet. It is the deepest hole to be drilled in Oklahoma.

The fifth producer was near completion in the Coyle pool, Payne County, at Magnolia Petroleum Co. No. 1 Cain, NW SW Section 12-17-1e, one 40-acre location south of production. It was bottomed at 4,897 feet and flowed 385 bbls. of oil in 15½ hours on initial test. The fourth producer was completed earlier in the week at Texas Co. No. 2 Minnich, SE NE Section 11-17-1e. It was washed in and flowed 355 bbls. of oil, with 257,000 cu. ft. of gas, in 24 hours from 4,852 feet, total depth.

Wildcat Operations

Harper & Turner and others No. 1 Taylor, SE NE NW Section 23-8-2w, wildcat in Cleveland County, topped Viola lime at 7,620 feet; Simpson 7,680 feet; dolomite 7,750 feet, had dry Wilcox sand at 7,994-8,007 feet, total depth, and was abandoned.

Henry Groce and others No. 6 Collins, NW NW NE Section 18-4s-10w, Cotton County wildcat, had sand showing oil with a hole full of water at 1,240-46 feet and was abandoned at 1,288 feet, total depth, in broken sand.

English & Morgan No. 1 Lee, NW NW SE Section 36-2n-19w, wildcat south of Hedrick in Jackson County, was drilling in shale below 500 feet.

Paul Hill No. 1 Bresley, NE NE NE Section 22-1s-19w, wildcat in Tillman County and 4 miles southeast of the Tipton pool, was a location.

Sinclair Prairie Oil Co. No. 1 Clelland, NE SW SE Section 26-1n-8e, wildcat northwest of Clarita in Coal County, had dug pits.

Seminole County

J. Ligon and others No. 1 Logan, SW NW NE Section 25-8-7e, Rosanna area, Seminole County, was completed for 400 bbls. of oil daily at 3,348 feet, total depth.

Rogers & Rogers No. 1 Martha, NE NW NE Section 1-7-7, was bottomed at 3,237 feet, failed to find production by plugging back and was abandoned.

Amerada Petroleum Corp. No. 1 Rice, SW SE SE Section 5-8-6, old total depth 4,311 feet, was plugged back to 4,092 feet, acidized and produced 170 bbls. of oil daily.

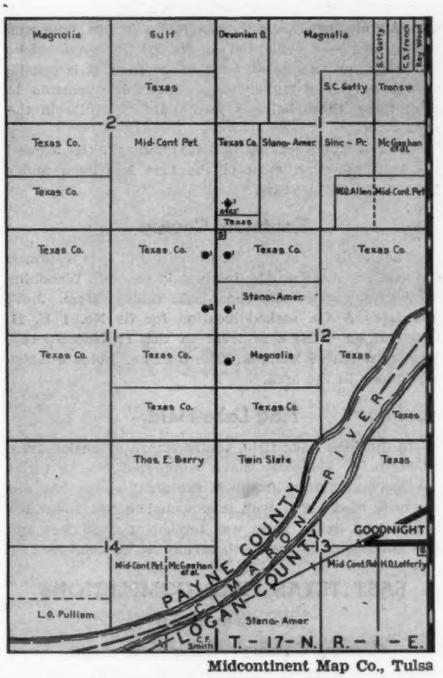
New activity in Seminole County: Magnolia Petroleum Co. No. 1 Harjo, NW SW NW Section 35-10-6, location; Halko-Myers No. 1-A Townsite, NW SE NW Section 19-8-8, location; Sunray Oil Co. No. 1 Reed, SW NE SW Section 12-6-5, rigging up rotary; Malernee & Shelton No. 2 West, SW SE NW Section 33-7-6, rigging up rotary.

Pottawatomie County

H. Schaffer No. 1 Jones, NW SW NW Section 5-6-5, St. Louis district, Pottawatomie County, topped dolomite at 4,169 feet, total depth 4,292 feet, was acidized and had initial yield of 58 bbls. of oil.

Same operator's No. 1 Zoeller, SE NE NE Section 6-6-5, an old well, was deepened from 4,160 feet to 4,215 feet and produced 112 bbls. of oil daily.

Magnolia Petroleum Co. completed a 7-bbl. well at No. 4 Lynn, SW NE NE Section 21-7-4. It found Hunton lime at 3,634 feet and was bottomed at 4,137 feet.



Midcontinent Map Co., Tulsa

Two producers recently were completed in the Coyle pool, Payne County, making a total of five oil wells in the pool

Deep Rock Oil Corp. No. 1 Richardson, SE NE NE Section 32-7-4, an old well, was deepened from 4,210 feet to 4,275 feet, acidized and recompleted for 119 bbls. of oil daily.

Mid-Continent Petroleum Corp. No. 1 Guinn, SW SE NE Section 20-7-5, an old well, was plugged back from 4,239 feet and recompleted for 100 bbls. of oil daily.

Eagle Oil Co. No. 1 Green, NW NW SE Section 29-7-5, had initial daily yield of 329 bbls. of oil at 4,093 feet, total depth.

Alma Oil Co. No. 7 Smith, SW SW NE Section 32-7-5, found dolomite at 4,027 feet, total depth 4,055 feet, was treated with 5,000 gallons of acid and completed for 150 bbls. of oil daily.

Big Chief Drilling Co. No. 3 Canfield, NE SW SW Section 33-7-5, topped dolomite at 4,102 feet, total depth 4,188 feet, plugged back to 4,150 feet, perforated casing, acidized and produced 285 bbls. of oil in 24 hours, initially.

Same company's No. 2 Canfield, SW SW SW Section 33-7-5, an old well, was deepened from 4,178 feet to 4,245 feet, acidized and had initial yield of 200 bbls. of oil daily.

McIntyre and others No. 1 Wolf, NW NW SE Section 33-7-5, was dry and abandoned at 4,314 feet, total depth.

First reports of new work in Pottawatomie County: W. A. Delaney No. 2 Bruno, SW NE SE Section 31-7-5, rig; Magnolia Petroleum Co. No. 6 Nicklos, SW SW NW Section 31-7-5, building rig; Ray Stephens No. 1 Copeland, SW NW NW Section 5-6-5, moving in tools; Mid-Continent Petroleum Corp. No. 4 Kah-Dot, NE NE SE Section 36-7-4, building rig.

Estimated Daily Production

Estimated daily production for Oklahoma for the week ending March 18, and for the preceding week, was as follows:

	Barrels	
	Mar. 18	Mar. 11
Allen	5,575	5,675
Billings	5,125	4,775
Burbank	7,675	7,750
South Burbank	9,250	9,325
Balance Osage	18,500	18,400
Blackwell district	3,750	3,775
Bristow-Slick	6,900	6,950
Chandler	1,725	1,700
Crescent	3,450	3,425
Cromwell	3,075	3,050
Cushing-Shamrock	10,025	9,975
Duncan district	4,150	4,075
Edmond	4,575	4,825
Fish	2,400	2,425
Fitts	30,150	30,200
Jesse	2,275	2,650
Graham-Fox	4,375	4,350
Gray	775	750
Healdton	8,800	8,875
Hewitt	3,575	3,650
Keokuk	3,725	3,700
Konawa	1,075	1,050
Lucien	7,875	7,650
Moore	3,850	4,250
Oklahoma City	117,800	115,900
Olympic	3,250	3,350
Ramsey	3,250	3,250
Sasakwa	1,325	1,300
Sholem-Alechem	2,250	2,275
Seminole district:		
Bowlegs	7,750	7,775
Carr City	3,000	3,025
Dora	4,300	4,325
Earlsboro	4,325	4,475
South Earlsboro	525	550
East Earlsboro	3,975	4,125
Little River	6,550	6,700
East Little River	700	725
Maud	1,025	1,075
Mission	1,400	1,375
Seminole	7,425	7,550
East Seminole	1,425	1,450
Searight	2,225	2,250
Total Seminole	44,625	45,400
St. Louis-Pearson	27,750	27,600
Tatums	1,625	1,600
Tonkawa-Garber-Thomas	4,025	3,950
Wewoka	2,050	2,075
Yale-Jennings	3,625	3,575
Other pools	82,250	82,750
Total Oklahoma	446,475	446,275

Pontotoc County

Simpson-Fell and others No. 1 Bates B, NE NE SW Section 26-2n-7e, Fitts field, Pontotoc County, topped Hunton lime at 3,875 feet, total depth 3,971 feet, was treated with 6,000 gallons of acid and made initial daily potential of 2,179 bbls. of oil.

Konawa Development Co. No. 2 Masters, SE SW SW Section 14-2n-7e, Fitts district, Pontotoc County, was completed for 63 bbls. of oil daily at 1,404 feet, total depth.

Phillips Petroleum Co. No. 19 Norris, NE NE SW Section 25-2n-6, a twin well, was bottomed at 2,675 feet, plugged back to 2,645 feet, was shot and completed for 25 bbls. of oil daily.

Same company's No. 16 Norris, SW SE SW Section 25-2n-6, and No. 17 Norris, SE SE SW Section 25-2n-6, old wells, were plugged back and recompleted for 185 bbls. of oil and 18 bbls. of oil daily, respectively.

(Continued on Page 134)

North and East Texas

By
D. H. STORMONT

1,200-Bbl. Clay County Well Starts Leasing and Blocking

WICHITA FALLS, Tex., Mar. 20.—Opening of a new oil pool for Clay County and resulting in leasing and blocking in the area featured the week's development in the North Texas area. L. T. (Bobby) Burns No. 1 A. L. Browning, Block 94, J. Belcher Survey, 6 miles southwest of Blue Grove and 12 miles southwest of Henrietta, was brought in flowing 312 bbls. of 44.2-gravity oil in six hours or at the rate of about 1,248 bbls. per day. The discovery well averaged 52 bbls. of oil an hour for the six-hour period. The casing pressure was 500 pounds at the close of the six-hour test, having dropped 150 pounds below the opening pressure gauge. Flowing pressure on the tubing was 210 pounds at the start of the test and 75 pounds at the close.

Burns has staked location for his No. 2 Browning as an east offset to the discovery well. The location is in the southwest corner of Block 70, Belcher Survey. The discovery well is producing from oil sand in the Strawn series from 4,432 feet to 4,461 feet, bottomed in sand. Next location for the area will be staked some time during the next week and will be on a 640-acre tract leased by Burns and the Consolidated Oil Co. from the Scaling Estate. The tract lies 1 mile northwest of the discovery well and is in the H.T.&B. Survey.

Five miles west of the new well, a wildcat has been staked by the Frabor-Hodges and Mid-Union Drilling Co. as their No. 1 R. C. Kinder, in the northeast corner of Lot 11, Block 2, Clark & Plumb subdivision, on a 150-acre tract. The wildcat is located on a block of 2,200 acres in which spreads were reported sold to the Magnolia Petroleum Co. and the Continental Oil Co. for $25 an acre.

Montague County

Cordova Union Oil Co. has staked a new Strawn sand test in Montague County to give that county its second deep test within two weeks. The company staked No. 1 R. L. Cable in the S. H. Stevenson Survey, Abstract 682. The wildcat is on a block of 6,000 acres, and is 5 miles south of St. Jo in the east central part of the county.

Three miles southwest of Montague, Staley Oil Co. was rigging up rotary and drilling water wells for No. 1 Ed Nunnelly, on a 7,000-acre block. The test is contracted to 4,300 feet.

In the Strawn sand pool opened several weeks ago by J. W. Holmes and Joe Benton No. 1 Bowers Estate, Block 47, M.E.P.&P. Survey, northeast of Bonita, Continental Oil Co. and United Producers Co. No. 1 Langford, south offset to the discovery, drilled oil sand from 2,920-24 feet where operators bottomed the hole to run casing. The offset test, with 36 feet higher surface elevation, encountered the top of the sand at about the same level as the discovery.

Archer County

Activity around the new pool opener by E. P. Griffin in Section 3, Block 4, H.&T.C. Survey of northern Archer County, featured the developments in the county. While waiting on the official gauge at his No. 1 Waggoner, E. P. Griffin was preparing to spud No. 2 Waggoner 330 feet north of the discovery. The new pool opener is 6 miles southwest of the K.M.A. pool.

Another new test in the county is due to get under way with British American Oil Co. rigging up rotary for its No. 1 T. B. Wilson, NW cor. Section 12, Block 3, H.&T.C. Survey, southeast of the new pool opener.

Cooke County

Two new wildcat locations and plans for a third revived interest in the deep Strawn pool of northeastern Cooke County where Sinclair Prairie Oil Co. has four producers, all completed for more than 1,000 bbls. On a farmout from the Texas Co., Tom C. Patten, Inc., has staked location for his No. 1 Honeycutt, in the J. M. Ford Survey, contracted to 5,000 feet. The second location is the Walter Gant No. 1 R. Crumb. 80-acre tract in the northeast corner of Block 55, Fannin County School Lands, Abstract 1248, 1 mile north and east of the Patten location. It is reported plans are being worked on for a third location on a block of 1,250 acres 1 mile south of the Patten test.

EASTERN TEXAS

DALLAS, Tex., Mar. 20.—A new Woodbine oil pool for northern Henderson County is indicated in the Tyler & Smith No. 1 Rowe & Baker, J. T. Childress Survey, 3½ miles north and east of the Flag Lake field. Operators cored from 3,140-45 feet recovering sand showing oil. An electrical survey was made of the hole and casing has been cemented on top of the sand. Since the test is on the Mexia fault line system, it is considered a new field rather than a possible extension to Flag Lake, there being several parallel faults in the area.

There is some trading in leases and royalties around the test; however, most of the area has been under lease for several years.

Kaufman County

The staking of a new location in southern Kaufman County has added to the interest in possible Woodbine sand production along the Mexia fault system. J. F. Morrissey & Co. staked location for its No. 1 E. H. Coleman on a 210-acre tract in the Trevino Survey, 3 miles north of Mabank. The operator holds a 3,200-acre block in the area.

Flag Lake Field

In the Flag Lake field, southwestern extension area, Richards & Holloway have completed No. 2 Cities Service-Tarkington, although the final gauge has not yet been made. The well is expected to test about 100 bbls. of oil daily. Sand was topped at 3,035 feet and bottomed at 3,040 feet with casing set at 3,033 feet.

EAST TEXAS FIELD COMPLETIONS

(One-hour gauge)

Gregg County—Longview Area

Davis & Smith No. 6 G. S. Mattox, 3,596-3,631 feet, 6 bbls. Shell Petroleum Corp. No. 20 Stinchcomb, 3,472-3,528 feet, 50 bbls.

Gregg County—Kilgore Area

Gulf Oil Corp. No. 10 G. Davis, 3,554-58 feet, 60 bbls. Potter Brothers No. 2 Crim, 3,542-70 feet, 60 bbls.

EAST CENTRAL TEXAS COMPLETIONS

(24-hour gauges)

Falls County

Marshal & Hayes No. 1 M. Murphy, 1,190-1,221 feet, 33 bbls.

Houston County

Leggett & Gossett No. 1 B. F. Gardner, dry and abandoned at 2,200 feet.

Trinity County

C. D. Davis No. 1 J. P. Gibson, dry and abandoned at 2,630 feet.

Upshur County

Brown-Gardner No. 1 J. J. Crawford, dry and abandoned at 4,173 feet.

NORTH TEXAS COMPLETIONS

(24-hour tests)

Archer County

E. P. Griffin No. 1 Waggoner, 4,707-08 feet, 744 bbls. Cree & Hoover No. 3 J. H. Turbeville, 1,495-1,509 feet, 60 bbls. Rathke Oil Co. No. 4 Cowan, 1,127-29 feet, 90 bbls.

Clay County

L. T. Burns No. 1 Browning, 4,423-52 feet, 1,248 bbls. Duncan & Arnhold No. 8 T. P. Duncan, 1,186-1,200 feet, 80 bbls.

Cooke County

B. F. Thompson and others No. 2 J. Weisman, 906-11 feet, 70 bbls.

Montague County

Seitz-Comegys-Seitz No. 6-B Roach, 2,128-45 feet, 270 bbls.

Wichita County

Grace & Woods No. 1 Love, 3,948-4,035 feet, 350 bbls. Consolidated Oil and Howard No. 4 James, 3,938-89 feet, 2,000 bbls. Board of Mineral Development No. 6 State, 3,699-3,788 feet, 688 bbls. Monty Staniforth No. 2 Reiley, 1,381-83 feet, 50 bbls.

Wilbarger County

Phillips & King No. 3 Waggoner, 3,205-10 feet, 1,080 bbls. Falls Refining and King Oil No. 2 Owens, 2,610-20 feet, 320 bbls.

Young County

Henry Zweifel and others No. 1-C Sewall, 3,828-3,960 feet, 600 bbls. Seiboldt Drilling Co. No. 2 C. Wolfe, 3,954-97 feet, 550 bbls. L. Lawler and others No. 1 Jim Watkins, temporarily abandoned 4,200 feet. Charles B. King No. 1 Stewart, dry and abandoned at 875 feet.

West Texas Fields

(Continued from Page 117)

4,910-5,125 feet, 1,123 bbls. Shell Petroleum Corp. No. 1 J. M. Rutts, 5,080-5,229 feet, 161 bbls.

PANHANDLE FIELD COMPLETIONS

(24-hour tests)

Carson County

Magnolia Petroleum Co. No. 51 fee No. 244, 2,948-94 feet, 178 bbls.

Hutchinson County

Cree & Hoover No. 3 W. B. Haile, 2,915-3,026 feet, 910 bbls. Gulf Oil Corp. No. 90 Dial, 2,914-84 feet, 194 bbls. Holmes and others No. 1 J. A. Stewart, location abandoned. Phillips Petroleum Co. No. 38 Cockrell Ranch, 3,017-61 feet, 300 bbls. Phillips Petroleum Co. No. 8 Gary, 3,222-66 feet, 205 bbls. Seaboard Oil Co. No. 7 Whittenburg, location temporarily abandoned.

Moore County

Texoma Oil Co. No. 15 J. N. Sneed, 2,520-3,006 feet, 29,147,000 cu. ft. gas. Texoma Oil Co. No. 15 J. N. Sneed, 2,606-2,969 feet, 15,590,000 cu. ft. gas. Texoma Oil Co. No. 6 Terry Thompson, 2,815-3,194 feet, 51,069,000 cu. ft. gas.

Wheeler County

T. G. Williams No. 3 W. E. Bentley, 2,320-67 feet, 20 bbls.

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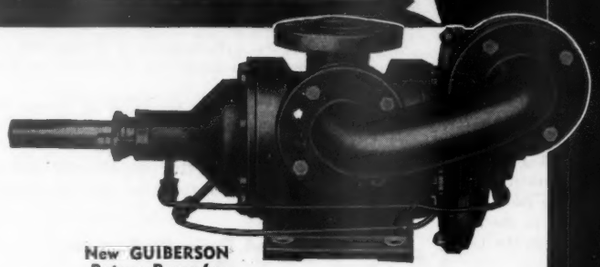

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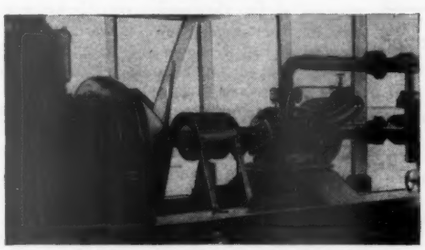

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GUIBERSON

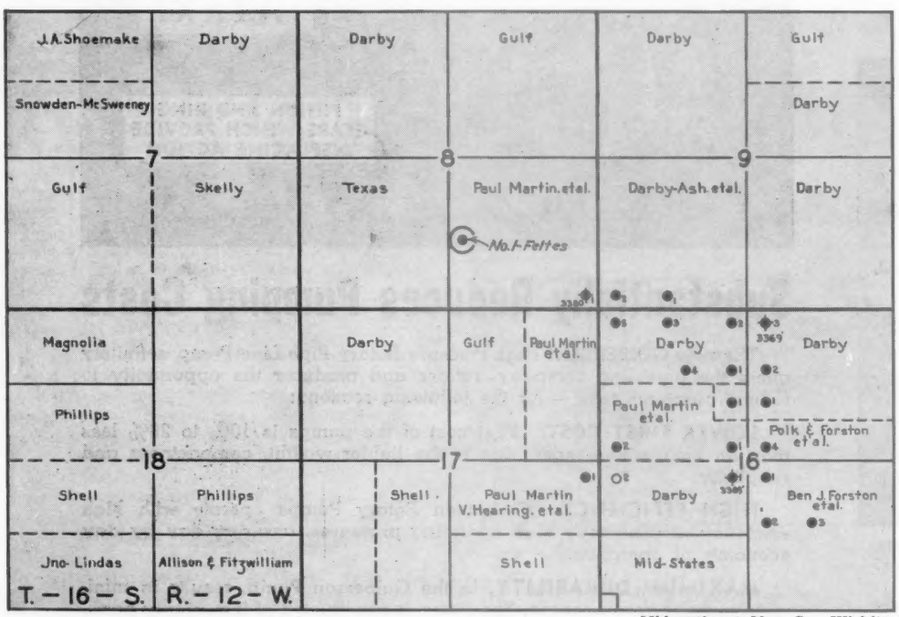
Kansas Developments

By
DAL DALRYMPLE

Record Hittle Producer Good for 7,161 Barrels in 24 Hours

The largest Kansas producer of 1939 to date was completed the past week in the Hittle pool, Cowley County, for a 24-hour potential of 7,161 bbls. of oil from Arbuckle lime—said to be a record for initial potential from that formation in the state.

The new well is the McKnabb & Blair No. 3 N. T. Hittle, SW SW NE Section 21-31-4e, at the north end of the field. Arbuckle lime was found at 3,291 feet and the hole was bottomed at 3,302 feet. It is an east offset to the Hartman & Blair No. 3 Waite, SE SE NW Section 21-31-4e, completed about three weeks ago for initial potential of 6,730 bbls., and a north offset to the Texas Co. No. 8 Hittle, NW NW SE Section 21, completed two weeks ago for potential of 5,233 bbls. A fourth big producer was near completion at the week-end at Texas Co. No. 4 Goodrich, NW SW SE Section 21, which found Arbuckle lime at 3,267 feet and on pre-



Midcontinent Map Co., Wichita

Martin & Hearing opened a Topeka lime pool in Section 8-16-12w, northwest of the Beaver pool, Barton County

liminary test started producing at the rate of 120 bbls. of oil an hour. There were six active operations in the field, making it one of the busier Kansas areas. Arthur Brewer was preparing to test at No. 1 King, NW SW NW Section 27-31-4e, farthest southeast well in the pool, which had 2,500 feet of oil in the hole from Arbuckle lime at 3,468 feet and was due for completion.

Several producing areas were extended, including the Campbell pool in Rice County. It was extended one-half mile northwestward at Duwe & Farris No. 2 Purcell, SE NE NW Section 33-19-9w. The Cunningham oil and gas pool in Kingman and Pratt counties was extended three-fourths mile southwestward in the latter county at Drillers Gas Co. No. 1 Hoagland, SE NW NE Section 27-26-11w, which produced 28,660,000 cu. ft. of gas on initial test. The South Silica pool in Barton County was extended into Rice County at Gulf Oil Corp. No. 1 Yeo, NW NW NW Section 30-20-10w. The South Letsch pool in Russell County was extended three-fourths mile northwestward at Skelly Oil Co. No. 1 Carter, C S half SW NE Section 33-14-13w. The Buhler pool in Reno County was extended one-half mile westward at Westgate-Greenland Oil Co. No. 1 Johns, SE SE SW Section 25-22-5w.

Wildcat Operations

Continental Oil Co. No. 1 Russell, SW SW NE Section 13-25-13w, extended the Leesburgh pool, Stafford County, one-half mile southeastward when completed at total depth of 4,075 feet for 24-hour potential of 2,843 bbls. of 38-gravity oil. It had Arbuckle lime at 4,024-75 feet and pumped 947 bbls. of oil in eight hours. Location is three-fourths mile south and one-fourth mile east of the company's No. 1 Fair well, completed April 22, 1938, for initial potential of 852 bbls. of oil at 4,151 feet, total depth. The No. 1 Russell is the third producer to be completed in the pool. The Continental company has 1,760 acres in the Leesburgh area, which is 4 miles south of the St. Johns pool, under lease.

Phillips Petroleum Co. No. 1 Esch, SE SE NE Section 19-33-6, wildcat in Cowley County, topped Arbuckle lime at 3,525 feet, had a show of dead oil in the first 2 feet in that formation but was dry and abandoned at 3,552 feet, total depth.

W. M. McKnab was reported moving in material at No. 1 Spurgeon, SE SW SW Section 28-10-15, wildcat in the Forest City basin about 8 miles northwest of Topeka, Shawnee County. It is his second wildcat to be started in Shawnee County, being about 10 miles northeast of his No. 1 Fritz, Section 4-12-14, first wildcat to be started in the Forest City basin since the lease boom began in that four-state area last summer. Due to an error in selection of photographs, a picture reputed to be that of No. 1 Fritz and published in connection with a recent article on the Forest City basin was that of an earlier test drilled in the district.

Blue Stem Oil Co. of Denver was moving in material at No. 1-A Donaldson, SE NE NE Section 25-5s-18w, wildcat in Phillips County. Location is about 4 miles northwest of the Faubion pool in northern Rooks County.

Sinclair Prairie Oil Co. No. 1 Price, NW NW SW Section 22-28-20w, wildcat near Mullinville in Kiowa County, was a location.

Gulf Oil Corp. No. 1 Bamgrover, C W half SW SW Section 30-19-9w, was location for a wildcat in Rice County.

York State Oil Co. No. 1 Marchand, C E half NE NE Section 24-20-12w, wildcat in the Ellinwood district, Barton County, had started drilling.

Phil-Han Oil Co. No. 1 Hill, SE SW SW Section 16-14-14w, wildcat east of the Fink pool in Russell County, was a rig.

Estimated Daily Production

Estimated daily production for Kansas for the week ending March 18, and for the preceding week, was as follows:

	Barrels	
	Mar. 18	Mar. 11
Oxford City	1,075	1,175
Burrton	8,275	9,025
Ritz-Canton	5,575	6,450
Graber	3,750	2,575
Hollow-Nikkel	2,950	3,350
Lerado	775	400
Voshell	1,625	1,825
Wellington	2,075	2,275
Ellsworth County:		
Lorraine	1,900	1,675
Other pools	1,310	665
Rice-Barton counties:		
Bloomer	1,900	1,900
Chase	4,375	4,150
Geneseo	3,975	3,025
Raymond	950	550
Silica	10,450	6,975
South Silica	2,025	1,425
Keesling	925	250
Wherry	4,350	2,050
Miscellaneous Rice	7,235	3,860
Miscellaneous Barton	8,060	5,150
Russell County	24,475	19,050
Sedgwick County	3,825	3,900
Ellis:		
Bemis	5,675	5,525
Miscellaneous	2,640	2,675
Kingman County	830	620
Stafford County	5,415	3,320
Greenwood County	8,900	8,950
Butler County	19,675	18,525
Other fields	16,185	15,635
Total Kansas	161,175	139,000

Ellsworth County

One of the larger Kansas producers completed the past week was Continental Oil Co. No. 2 Fuller, SW SE SE Section 28-17-8w, Edwards pool, Ellsworth County. It had Arbuckle lime at 3,181-3,233 feet, total depth, pumped 741 bbls. of oil in eight hours and made potential of 2,222 bbls.

Same company's No. 1 Kunkle, NE NE SW Section 28-17-8w, topped Arbuckle lime at 3,248 feet, was bottomed at 3,263 feet, pumped 243 bbls. of oil in eight hours and made potential of 729 bbls.

Rice County

A 2,613-bbl. producer was completed in the Geneseo field, Rice County, at Continental Oil Co. No. 1-A Siemsen, NW NE SE Section 13-18-8w. It found Arbuckle lime at 3,219-24 feet, total depth, and pumped 871 bbls. of oil in eight hours.

C. L. Carlock No. 1 Johnson, SE NW SE Section 31-20-7w, Wherry field, penetrated conglomerate at 3,317-21 feet, total depth, flowed 566 bbls. of oil in eight hours and was rated potentially at 1,698 bbls. of oil daily.

McPherson Drilling Co. No. 1 Cramm, SE SE NW Section 15-19-9w, Cramm pool, pumped 254 bbls. of oil in eight hours and made potential of 761 bbls. Production was from Arbuckle lime at 3,202-08 feet, total depth.

New work in Rice County: Sinclair Prairie Oil Co.

No. 1 Smith, NE SE NE Section 1-19-8w, moving in material; Duwe & Farris No. 1 Wiens, SE NE NE Section 6-19-9w, moving in material Gulf Oil Corp. No. 1 Cramm, NW NW SE Section 15-19-9w, cellar; Bradley Oil Co. No. 1, NW NE NW Section 27-19-9w, cellar; C. H. Weaver No. 1 Peterson, C N half N half NE Section 4-20-9w, location; Texon Oil Co. No. 3 Peterson, SE SW SE Section 10-20-9w, building rotary rig; Mid-Plains Oil Co. No. 2 Blarcon, SW NE NW Section 10-21-7w, drilling below 880 feet.

Barton County

Stanolind Oil & Gas Co. No. 15 Panning, SW NE SE Section 2-20-11w, Silica field, Barton County, found Arbuckle lime at 3,267-77 feet, total depth, pumped 424 bbls. of oil in eight hours and made potential of 1,273 bbls.

Same company's No. 18 Panning, C N half N half NW Section 11-20-11w, pumped 644 bbls. of oil in eight hours from Arbuckle lime at 3,275-82 feet, total depth, and was rated potentially at 1,931 bbls.

Continental Oil Co. No. 2 Underwood, NE NW NE Section 10-17-13w, Ainsworth area, pumped 194 bbls. of oil in eight hours and made 24-hour potential of 583 bbls. It had Arbuckle lime at 3,344-53 feet, total depth.

Frank Hollow No. 1 Kowalsky, SE SE NE Section 18-20-11w, was building rotary rig.

Cities Service Oil Co. No. 3-C Bitter, SW NW NE Section 18-16-13w, penetrated Arbuckle lime from 3,391 feet to 3,397 feet, total depth, pumped 98 bbls. of oil and 35 bbls. of water in eight hours but was abandoned, according to field reports.

Stafford County

E. H. Moore, Inc., No. 3 Johnson, SW NE NE Section 13-24-11w, Zenith field, Stafford County, found Misener sand at 3,765-86 feet, flowed 105 bbls. of oil in four hours and made potential of 1,196 bbls.

Stanolind Oil & Gas Co. No. 4-B Siefkes, NE NE NW Section 3-22-12w, Sittner district, was rigging up rotary.

Pratt County

Shell Petroleum Corp. No. 1 Lemon, C SE Section 13-28-12w, Gilchrist pool, Pratt County, was completed for 1,500,000 cu. ft. of gas daily. It found Viola lime at 4,323-68 feet, plugged back to 4,339 feet and acidized but did not increase production.

Russell County

R. H. Shields No. 2 Rogg, SW NW SW Section 28-14-13w, Hall pool, Russell County, topped Lansing lime at 2,894 feet, total depth 2,938 feet, pumped 335 bbls. of oil in eight hours and made potential of 1,005 bbls.

Continental Oil Co. No. 3 Meharg, NE cor. Section 17-15-13w, Coralena pool, found Lansing lime at 3,041-96 feet, total depth, pumped 516 bbls. of oil in eight hours and made 24-hour potential of 1,549 bbls.

Cities Service Oil Co. No. 1 Redetzke, NE cor. Section 21-15-13w, North Fairfield area, had potential rating of 749 bbls. of oil after pumping 250 bbls. in eight hours. It topped Lansing lime at 3,060 feet, total depth 3,086 feet.

Ellis County

Kerlyn Oil Co. No. 7 Rumsey, NE SE SW Section 23-11-17w, Bemis field, found Arbuckle lime at 3,444-46 feet, total depth, and was completed for 24-hour potential of 3,500 bbls. of oil.

Phillips Petroleum Co. No. 1 Peavey, SW SW SE Section 13-11-18w, was a cellar.

McPherson County

Continental Oil Co. No. 6 Kindblade, SW NE SW Section 20-21-1w, Garber pool, McPherson County, topped Hunton lime at 3,281 feet, was bottomed at 3,328 feet, pumped 33 bbls. of oil in eight hours and made daily potential of 229 bbls.

Butler County

Cromwell & Lewis No. 7 Stern, NW NE NE Section 33-27-6, Stern pool, Butler County, found Viola lime at 3,054 feet, was bottomed in lime at 3,071 feet, and pumped 10 bbls. of oil in 24 hours.

New Work in Kansas

In Cowley County, Hartman & Blair No. 4 Waite, NE SE SW Section 21-31-4e, was a rotary rig; Arthur

(Continued on Page 146)

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Eastern Field Report

By STAFF CORRESPONDENT

New Penn's Test in Fayette County Near Oriskany Pay

PITTSBURGH, Pa., Mar. 20.—The test of the New Penn Development Co., William E. Snee and others on the Indian Creek Coal & Coke Co. tract on Chestnut Ridge in South Union Township, Fayette County, Pennsylvania, is drilling at 7,090 feet, or 165 feet in the cherty zone of the Onondaga lime. Here the samples gave evidence of having reached the cherty shale break near the bottom of this member and drilling should reach the Oriskany within a few days.

The gas volume from the Onondaga still remains at about 900,000 cu. ft. a day with no increase since 7,030 feet at which time the rock pressure was 2,925 pounds with some gas leakage. This will be the second cable tool test to reach the Oriskany on this structure, the other being the test on the J. H. Sorg farm in which there was 1,500,000 cu. ft. a day from the first pay in addition to the gas acquired in the Onondaga. The rock pressure in this test is reported as 2,890 pounds in 26 hours.

The New Penn Development Co. and William E. Snee have tentatively made two new locations on this structure, one in the northwest corner of the Heyn (Summit Hotel) lease in North Union Township, and the other in the west corner half way between their test drilling on the Indian Creek Coal Co. lease and the test of the Peoples Natural Gas Co. on the Piedmont Coal Co. tract. They will be Nos. 3 and 4 on the lease and both will be lower on the west flanks of this structure which will prove interesting in determining the subsea axis.

The Carnegie Natural Gas Co. is now receiving gas from both Nos. 1 and 2 Heyn in its new line which extends from Chestnut Ridge near the test now drilling on the Indian Creek Coal & Coke Co. lease in South Union Township to within 1 mile east of Waynesburg in Greene County. The line was tested without incident and roughly about 3,000,000 cu. ft. a day is now being transported using only the pressure of the wells to make the 27 miles.

SOUTHEAST OHIO

In Licking County, Hope Construction & Refining Co. completed a 22-bbl. well on the Elbert Ashcraft farm, Lot 23, Perry Township, in Clinton sand, total depth 2,831 feet. In Section 9, Mary Ann Township, J. M. Thomas and others second test on the W. A. Connor farm, in Berea sand at 788 feet, is a 2-bbl. pumper.

In Noble County, W. C. Nohe and others completed a very small oil and gas well on the McGarry Brothers farm in Section 22, Jackson Township, in Berea grit at 1,639 feet. In Section 10, same township, Walker and Anderson test on the Alvin F. Wilson farm, had Berea grit at 1,673 feet and is a gas well gauging 95,000 cu. ft. a day, with no oil showing.

SOUTHWEST PENNSYLVANIA

In Menallen Township, Fayette County, Pennsylvania, Nollem Oil & Gas Co. completed a test on the Jesse Frost farm at 1,309 feet. The Big Injun sand was topped at 1,195 feet with 4,000,000 cu. ft. of gas showing at 1,307-09 feet. In this township, these operators are drilling at 385 feet in a test on the Andy Manyak farm.

In Amwell Township, Washington County, A. V. Lewis and others have started drilling on the William Dodds farm. Penn Oil & Gas Co. is building rig to deepen a well on the John D. Russell farm.

In Morris Township, Washington County, Manufacturers Light & Heat Co. is building rig for No. 4 R. W. Parkinson, serial No. 3578. In Hopewell Township, McFadden & Co. are drilling at 1,280 feet on the J. W. Reed farm.

In Greene County, Charles M. McVay shut down at 2,995 feet on the Elmas Laughman farm in Morris Township, with the Thirty-foot sand at 2,967-90 feet. O. I. Dille and others are drilling at 1,810 feet on the Ellsworth Beckham farm with the Big Injun sand topped at 1,798 feet.

In Franklin Township, Greene County, J. B. Myers and others are drilling at 1,925 feet on the Sallie Morris farm with the Big Injun sand topped at 1,875 feet. In Richhill Township, Burleigh Weight and others have reached 565 feet in the test on the Strawn heirs farm.

Deep Tests

On Chestnut Ridge in Springhill Township, Fayette County, L. J. Houze Convex Glass Co. is still fishing on the Paul Dunham farm, and drilling up the 200 feet of line still on the tools at about 7,600 feet.

In Armstrong County, Peoples Natural Gas Co. is drilling at 2,120 feet in the deep test on the Lowry Martin farm in Wayne Township.

WEST VIRGINIA

Several oil wells were completed in West Virginia during the week. In Calhoun County, D. A. Cronin completed a second well on the Bruce Bell farm in Sheridan district, at 1,156 feet, and will make about 3 bbls. a day.

In Marshall County, Guy B. and A. C. Patterson completed deepening No. 1 W. B. Patterson in Liberty district at 3,201 feet. After a 16-quart shot it was good for 4 bbls. a day.

In Pleasants County, B. C. Deem completed a second test on his fee in Jefferson district in the Squaw sand at 1,936 feet and it is good for 25 bbls. a day.

In Wirt County, W. C. Patterson completed No. 24 Robinson Petroleum Co. tract, in Clay district in the Cow Run sand, depth 585 feet, and it will make a 1-bbl. pumper.

Gas Wells

In Boone County, the Nelson Gas Co. completed a test on the Francis Pauley and others lease in Washington district, as a gas well at 2,111 feet with a gauge of 150,000 cu. ft. a day 24 hours after shot.

In Cabell County, R. H. Adkins, trustee, completed a test on the U. G. Bledsoe farm in McComas district, at 2,126 feet with a gauge of 175,000 cu. ft. a day 24 hours after shot.

In Calhoun County, W. H. Bickel completed No. 2 on the Luerna Barr farm in Sherman district at 1,940 feet, total gauge 300,000 cu. ft. a day.

In Lincoln County, R. H. Adkins completed a test on the T. C. Collins farm in Carroll district in the Berea sand, total depth 2,279 feet, and a final gauge of 160,000 cu. ft. a day.

In Mingo County, W. E. Burchett completed a 120,000 cu. ft. gas well on the B. F. Meade farm in Kermit district at 3,801 feet. In Harvey district, Mingo County, the Red Jacket Coal Co. completed No. 6 fee in the brown shale at 3,305 feet and it is good for 160,000 cu. ft. a day.

In Ritchie County, W. R. Corey on the Frank Kelley farm in Murphy district, got the Injun sand at 2,091 feet and has a gas well gauging 50,000 cu. ft. a day from the Keener sand.

In Wetzel County, Big Four Oil and Gas Trust completed a second test on the W. L. Herrick farm in Proctor district in the Cow Run sand at 554 feet and it is a gasser gauging 115,000 feet a day.

Oriskany Gas Field

No wells were completed in the Oriskany gas field in Kanawha County during the week but there were several new locations. In Poca district, Godfrey L. Cabot, Inc., made locations on the Putnam Co. lease for a second test, elevation 781 feet, and on the D. Holmes Morton farm for a No. 3, elevation 861 feet. Spartan Gas Co. made a location on the Burdette-Haston lease, elevation 822.57 feet. In Union district, the Ajax Gas Co. made location on the Perry Marks farm, elevation 776.8 feet.

In Poca district, the United Fuel Gas Co. topped Corniferous lime at 4,960 feet in No. 4822 W. F. Beane, and at 4,855 feet in No. 4823 G. C. Patterson and others. Godfrey L. Cabot, Inc., topped Corniferous at 4,901 feet on the Helem M. Hoge farm. The Hays Oil & Gas Co. is building the rig for the J. A. Wilkinson test. Meigs Development Co. has a rig up for the E. P. Higgenbotham test; United Carbon Co. drilling at 710 feet A. H. Campbell test, and building the rig for the D. D. Slater and others test; Poca Fork Oil & Gas Co. is rigging up the test on its fee in Elk district.

Outside Deep Tests

In Jackson County, Norwood P. Johnston, Joe Rubin and others have reached 4,477 feet on the D. P. Curry farm in Ravenswood district with the hole caving slightly and are believed to be less than 50 feet from the Corniferous lime.

In Ripley district, Jackson County, Everett Starcher and others have reached 4,843 feet in the test on the R. R. Boggess farm and a rig standing on the Grady F. Boggess farm, both extensions of the Elk-Poca fields in Kanawha County.

In Ripley district, about 6 miles southwest of the town of Ripley, Jackson County, the Columbian Carbon Co. has reached 2,000 feet on the G. W. Lathey farm, carrying a 13-inch hole. In Grant district, Pleasants County, this company is pulling the casing which was being carried down the hole and which stopped with a fishing job for a reamer lug at 4,825 feet, and will set 7-inch on a packer to shut off the shale oil and will then try to carry an open hole uncased to the Corniferous lime.

New Work

Locations have been made as follows: In Boone County, by Pond Fork Oil & Gas Co. for No. 3 fee in Washington district, elevation 1,173.7 feet; in Cabell County, by Swanson I. Isaacs, on the Wiley China Co. lease on the Ohio River in Guyandotte district; in Fayette County, by Northeastern Oil & Gas Co. for No. 4 and No. 5 on the Deitz Colliery Co. in Falls district, elevations 698 feet and 692 feet; in Cabell County, by Bowen Gas Co. on the Walter Childers farm in McComas district. In Lincoln County, by Left Fork Gas Co. on the Lucinda Lovejoy farm in Jefferson district, elevation 788 feet; by R. I. Petry on the R. W. Ramsey farm on Fisher Branch of Fourpole Creek in Union district, Wayne County; in Sheridan district, Lincoln County, by Guyan Gas Co. to deepen the No. 2 J. W. Jeffers; in Roane County, by O. H. Reed and others on the M. J. Hughes farm in Harper district, elevation 810.47 feet; by R. W. Healey on the G. N. Gandee farm, elevation 790.3 feet; in Wayne County, by the Chartiers Oil Co. on the I. J. and Wilson Buskirk farm in Butler district, elevation 702.4 feet.

Southwest Texas Fields

(Continued from Page 122)

No. 13-B White, sand 1,520-23 feet, 25 bbls., jetting with gas.

Guadalupe County

Darst Creek field: Cities Service Oil Co. No. 6 Dowdy, 2,617 feet, 110 bbls., pumping.

Hidalgo County

Samfordyce field: Brinkoeter Oil Corp. No. 2 Guerra, sand 2,849-59½ feet, 93 bbls., jetting. Fohs Oil Co.

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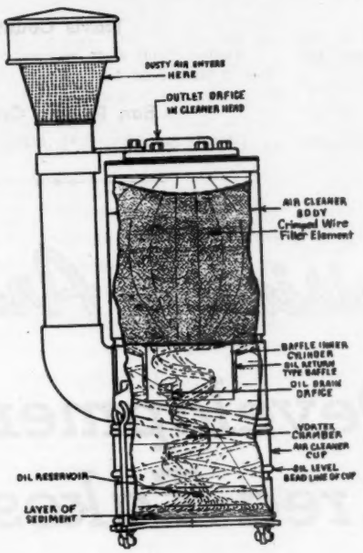

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No. 3-B Guerra, perforated casing 2,872-82 feet, 75 bbls., quarter-inch choke.

Jim Wells County

South Alice field: S. H. Howell No. 2 Mosser, 5,201 feet, abandoned.

Live Oak County

Oakville field: Simmons Oil Co. No. 4-B Reagan, perforated casing 2,826½-33 feet, 12 bbls., one-eighth inch choke.

McMullen County

Ezzell field: Harry Ezzell No. 31 Ezzell, perforated casing 1,502-08 feet, 66 bbls. pumping. E. M. Jones No. 69 Ezzell, perforated casing 1,520-27 feet, 314 bbls., pumping.

Milam County

Rockdale field: W. A. Jones No. 5 Coffield, 664 feet, abandoned.

Nueces County

Luby field: McCurdy and others No. 1 State, perforated casing 5,033-37 feet, 152 bbls., one-eighth inch choke. Seaboard Oil Co. No. 13 Shaeffer, perforated casing 4,356-60 feet, 93 bbls., one-eighth inch choke.

Refugio County

L Rosa field: Hewitt & Dougherty No. 1-B Rooke, 7,021 feet, abandoned. Mellon Creek field: Copano Oil Co. No. 2-C O'Connor, sand 5,895-5,900 feet, 395 bbls., three-sixteenths inch choke. Copano Oil Co. No. 3-C O'Connor, sand 5,887-98 feet, 395 bbls., three-sixteenths inch choke.

Starr County

Margo field: A. L. Bone No. 1 Garcia, 1,200 feet, abandoned.

Travis County

Kimbro field: J. M. Grimes No. 1 Lundgren, 655 feet, 3 bbls., pumping.

San Patricio County

East White Point field: Plymouth Oil Co. No. 1-C Lizzie Cole, perforated casing 5,666-73 feet, 120 bbls., 7/64-inch choke. Shell Petroleum Corp. No. 4 Kirk, sand 5,625-37 feet, 132 bbls., one-eighth inch choke.

Victoria County

Keeran field: Union Oil Co. of California No. 9 Keeran, perforated casing 6,076-82 feet, 37 bbls. 18 hours, one-eighth choke. East Placedo field: Stanolind Oil & Gas Co. No. 6 Vandenberge, 6,376 feet, 167 bbls., one-eighth inch choke.

Webb County

Killam field: O'Hearn & Ryan No. 2 Garcia, sand 1,978-88½ feet, 45 bbls. pumping.

Zapata County

Comitas field: Nordan & Morris No. 9-C Haynes, sand 1,231-38 feet, 60 bbls., pumping. Buffalo Oil Co. No. 3-A Lopez, sand 1,884-87 feet, 53 bbls., pumping. Mirando Valley field: Buffalo Oil Co. No. 6-A Hinnant, sand 1,929-35 feet, 100 bbls., jetting. Buffalo Oil Co. No. 5-A Hinnant, sand 1,907-15 feet, 87 bbls. 14 hours, jetting.

North Louisiana, Arkansas

Development in the Tri-State Area Takes Upward Swing

By GEORGE WEBER

SHREVEPORT, La., Mar. 20.—Drilling activity last week in the tristate area showed its first upward swing since late in 1938. The Shreveport field of Caddo Parish is responsible for many of the new operations, but increased drilling schedules are seen in other areas, particularly the Magnolia-Village area of Columbia County and the Schuler field of Union County, both in Arkansas. Of more possible future importance are the deep wildcat tests which are getting under way in three states. These tests, many of them drilled on carefully surveyed geophysical structures, show good prospects for success, and their progress will be watched with particular interest.

Three new deep wildcats in the Smackover lime trend got under way in the past week. Phillips Petroleum Co. is drilling No. 1 Askew in Columbia County, on a geophysical structure west of the town of Magnolia. Near the Arkansas-Louisiana border, Oliphant Oil Co. is rigging up No. 1 Union Sawmill Co., located in Union County, due east of Junction City. A few miles south of the Oliphant test, Standard Oil Co. of Louisiana and Joe Modisett are beginning No. 1-B Frost Lumber Industries. All three are projected to the Smackover lime, which has shown a good record of new flush production in South Arkansas during the past few months of drilling exploration.

Shreveport Field

The Shreveport field, given definite control measures recently, and enhanced by a crude price increase, is entering its first period of intensive drilling. At the end of the week there were 12 active rigs in the field, and more drilling operations are reported scheduled for early spudding. One well was completed and two others were in completion stages late in the week. The new well, Hurricane Petroleum Corp. No. 1-C Chandler, gauged 550 bbls. daily through a three-sixteenths inch choke, with tubing pressure of 1,060 pounds and casing pressure of 1,475 pounds. Harry Fotiades No. 1 Tomlinson, completed late in the week for an initial of 792 bbls. per day through a half-inch choke, and William C. Leisk, No. 1 Sinclair, an east edge test, are encountering salt water difficulties. The latter well flowed 33 bbls. of fluid hourly, 33 per cent salt water, and after shutting in, it was reopened to continue salt water production. A west edge test, which has had a long record of ill luck, C. D. Loe No. 1 Meyer, located on the south shore of Cross Lake, was junked and abandoned following a series of plug-back jobs in an effort to bring in commercial production. The well, drilled to the Pettit lime in early November, was abandoned at 5,631 feet. The failure does not definitely condemn the southwest edge of the field, as an eastern offset was recently brought in for a good producer, and operations are under way in the general vicinity of the dry hole.

Shongaloo Test

The Magnolia Petroleum Co. No. 1 Roseberry Unit, a deep test in the shallow Shongaloo gas field, encountered a show of production in the Sexton sand. The gas and distillate formation was cored at 9,145-82 feet, showing broken sand, and the operators are coring ahead at 9,297 feet. The test is located in northern Webster Parish.

In the Sibley area of the same parish, Union Producing Co. No. 1 Walker Unit was last reported drilling below 8,390 feet. The test is projected to the lower Marine sands which are productive in the nearby Cotton Valley field.

The Sligo field of Bossier Parish has an important west outpost test in Triangle Drilling Co. No. 1 Sandridge, located 1 mile west of present production in the 3,100-foot horizon. The test was in semiporous lime at 3,203-12 feet this week, and operators were waiting on cement after setting 7-inch casing at 3,200 feet.

In the Bisteneau area of Bienville Parish, Arkansas-Louisiana Gas Co. No. 1 Gayoso is being closely watched as it drills below 6,770 feet.

Schuler Activity

Following a sharp slump in drilling activity, the Schuler field again has eight wells drilling to the Jones sand horizon. While the field is nearly drilled up, a few remaining locations to be drilled will sustain activity in the field for some weeks to come.

Meanwhile, drilling is gaining in the Magnolia sector, with good results. During the week three good wells were completed. Alice Sydney Oil Co. No. 1 Crisp came in making 460 bbls. per day through a 12/64-inch choke. Tubing pressure was 400 pounds and casing pressure 1,400 pounds. Atlantic Refining Co. No. 1-B L. Garret is being completed, flowing at the rate of 790 bbls. daily through a 14/64-inch casing choke. The Southwood Oil Co., Inc., No. 2 Hutcheson gauged 420 bbls. daily through a 12/64-inch choke with tubing pressure of 1,300 pounds and casing pressure of 1,625 pounds.

In Natchitoches Parish, Jack Lent and others No. 1 Whatley, a wildcat in Section 17-10-10, was reported to be heading oil late this week. The test is bottomed at 3,300 feet, plugged back from an old total depth of 3,510 feet and swabbing operations earlier this week resulted in a small show of oil.

Production by Pools

Estimated daily gross production all companies week ending March 18:

NORTH LOUISIANA

	Barrels
Bellevue	685
Caddo light	4,055
Caddo heavy	2,525
Converse	455
Cotton Valley heavy	85
Cotton Valley light	*12,480
Cross Lake	2,745
De Soto and Red River	1,125
Elm Grove	200
Haynesville	2,875
Holly	75
Homer	2,670
Lisbon	3,950
Pleasant Hill	105
Rodessa	28,895
Sarepta-Carterville	†375
Sligo	1,080
Sugar Creek	290
Urania	2,790
Zwolle	2,970
Total	70,430

SOUTH ARKANSAS

Buckner	1,470
Champagnolle	1,725
El Dorado	1,710
Lisbon	250
Magnolia	3,085
Miller County	350
Nevada	595
Rodessa	5,165
Schuler	18,925
Smackover light	1,890
Smackover heavy	14,810
Stephens	515
Troy	1,050
Urbana	1,175
Village	590
Total	53,305

Texas side of Rodessa field 31,230 bbls. daily.

*4,630 bbls. is distillate.
†150 bbls. is distillate.

Rocky Mountain Area

By
T. R. INGRAM

Producers in Kevin-Sunburst Are Given Increased Market

DENVER, Colo., Mar. 20.—The Mountain Fuel Supply Co. No. 1 Florence Wilson, Hiawatha gas field, northwestern Colorado, was recompleted for 5,000,000 cu. ft. of gas in a lower sand in the Wasatch after drilling deeper to test oil sand in nearby well. Colorado had no new operations.

The General Petroleum Corp. No. 1 State, a wildcat on Cole Creek, Wyoming, better than a mile north of the discovery well, was dry in the Sundance and was plugged and abandoned. The North Platte structure, 5 miles west of Casper, is to have another test. The Ohio Oil Co. No. 5 Agnes Rohlff, in Lance Creek, made 190 bbls. initially from the Sundance. Location for an important test ahead of production was released in the Minnelusa Oil Corp.-MacKinnie Oil & Drilling Co. No. 5 Thompson. The F. F. Hintze wildcat on Buck Creek, east of Lance Creek, is plugging back after drilling to Sundance to test a show of oil in the Dakota.

Montana had no completions or new operations. Work has started on the Glacier Production Co. new refinery in Cut Bank, and the International Refining Co. is increasing its purchases of Kevin-Sunburst crude.

NEW MEXICO

Only six wells were completed in Lea County, southeastern New Mexico, the past week, but they included big producers in the South Eunice and Vacuum fields. No completions in Eddy County were reported.

Plains Production Co. No. 1 Daugherty permit, SE cor. Section 11-17-27, was a new wildcat in the Red Lakes area northwest of the Artesia field, Eddy County. Spudder was on location.

Completions in Lea County were:

Texas Pacific Coal & Oil Co. No. 14-A State, Account 2, C NW NE Section 11-22-36, South Eunice field, had estimated potential of 9,600 bbls. of oil daily, based on six-hour test of 2,400 bbls., flowing through casing. Gas gauged 4,000,000 cu. ft. daily. Seven-inch casing was set at 3,681 feet, 2-inch tubing at 3,772 feet. It had pay at 3,700-3,790 feet, total depth.

Phillips Petroleum Co. No. 20 Santa Fe, C SW SW Section 27-17-35, Vacuum field, flowed 100 bbls. of oil naturally in three hours through tubing, was acidized and flowed 366 bbls. in eight hours through three-fourths inch choke. Gas measured 215,000 cu. ft. daily. Pay was found at 4,364 feet, total depth 4,607 feet.

Magnolia Petroleum Co. No. 26 State Bridges, C SE SW Section 26-17-34, topped pay at 4,550 feet, was bottomed at 4,710 feet in lime, and was completed naturally, flowing 90 bbls. of oil in 24 hours through one-fourth inch choke on tubing set at 4,708 feet.

Same company's No. 1-O State, C NW SW Section 33-17-35, found pay at 4,420 feet, total depth 4,650 feet, and flowed 460 bbls. of oil daily through three-fourths inch choke on tubing set at 4,648 feet. Seven-inch casing was set at 4,150 feet.

Continental Oil Co. No. 4 Jack A-20, C SW NE Section 20-24-37, Mattix pool, flowed 30 bbls. of oil an hour for two hours through three-fourths inch choke on tubing set at 3,553 feet. Gas gauged 1,540,000 cu. ft. daily. Top of pay was 3,370 feet, total depth 3,580 feet.

Weiner No. 2 Woolworth, SW NW SW Section 33-24-37, topped pay at 3,430 feet, total depth 3,565 feet in lime, set 2-inch tubing at 3,540 feet, and flowed 5 bbls. of oil an hour through one-fourth inch choke, with 1,000,000 cu. ft. of gas daily.

Lea County

Fred Turner, Jr., No. 1 Lea Co. State Bank, C SW SW Sec. 30-14-38 (wildcat). Drlg. 280 ft.
Carper-Taylor No. 1 Taylor (wildcat), SW SW SW Sec. 30-16-32. Drlg. 2,975 ft.
Repollo Oil Co. No. 2 State, Lse. 182, C S½ NE SW Sec. 31-16-37. Drk.
Carper Drlg. No. 1 Simon, C NE NE Sec. 29-17-32. R.U. mch.
Continental Oil Co. No. 1-A Sanderson B-14, C N½ NW NW Sec. 14-20-36. W.O.C. 1,443 ft.
Continental Oil Co. No. 5 State H-35, C SW NE Sec. 35-17-34. Drlg. 4,655 ft.
Humble O. & R. Co. No. 2-K State, C NW NE Sec. 32-17-35. T.D. 4,675 ft.; swbg.
Humble O. & R. Co. No. 3-K State, C NE SE Sec. 28-17-35. Drlg. 4,608 ft.
Humble O. & R. Co. No. 4-K State, C NE SE Sec. 32-17-35. C.&P.
Magnolia Pet. Co. No. 1-P State, C SW SE Sec. 22-17-35. Drlg. 4,330 ft.
Magnolia Pet. Co. No. 3-J State, C SE NE Sec. 22-17-34. Drlg. 3,910 ft.
Magnolia Pet. Co. No. 27 State-Bridges, C SE NE Sec. 26-17-34. Drlg. 3,696 ft.
Magnolia Pet. Co. No. 28 State-Bridges, C NW NW Sec. 26-17-34. M.I.R.
Magnolia Pet. Co. No. 29 State-Bridges, C SW SW Sec. 26-17-34. Drlg. 150 ft.
Maljamar O. & G. Co. No. 2-B Baish, C NE NE Sec. 27-17-32. T.D. 2,602 ft.; S.D.O.
Maljamar O. & G. Co. No. 2 Mitchell, SW SE SW Sec. 5-17-32. Drlg. 680 ft.
Ohio Oil Co. No. 1 State-Warn, C SE NE Sec. 33-17-35. W.O.C. 510 ft.
Ohio Oil Co. No. 2 State-Staplin, C NE SW Sec. 30-17-35. T.D. 4,710 ft.; swb. 6 B.O.P.H.
Phillips Pet. Co. No. 12 Santa Fe, C NE SW Sec. 28-17-35. T.D. 4,700 ft.; C.O.
Phillips Pet. Co. No. 15 Santa Fe, C NE NE Sec. 28-17-35. T.D. 4,700 ft.; C.O. 4,557 ft.
Phillips Pet. Co. No. 24 Santa Fe, C NE NE Sec. 34-17-35. T.D. 4,590 ft.; to test.
Phillips Pet. Co. No. 26 Santa Fe, C NE SW Sec. 29-17-35. T.D. 4,645 ft.; 3 treatments and F. 13 B.O.P.H.
Phillips Pet. Co. No. 28 Santa Fe, C NE SE Sec. 33-17-35. Drlg. 3,920 ft.
Repollo Oil Co. No. 2 State, Lse. 197, SE NE SE Sec. 6-17-34. S.S.O. 4,897 ft.; drlg. 4,946 ft.
Shell Pet. Corp. No. 1-C State, C NE SE Sec. 24-17-34. T.D. 4,733 ft.; swb. 340 B.O. in 54 hrs.
Shell Pet. Corp. No. 1-V State, C NE SE Sec. 21-17-35. Rng. tbg. 4,680 ft.
Standard Oil Co. of Texas No. 2 State, Lse. 6, C NE SW Sec. 34-17-35. T.D. 4,212 ft.; drlg. plug.
Stanolind O. & G. Co. No. 2 State, C SE NW Sec. 1-17-36. W.O.C. 4,548 ft.
Texas Co. No. 2-S State, C SW SW Sec. 35-17-34. Drlg. 60 ft.
Texas Co. No. 1-T State, C SE NE Sec. 25-17-34. T.D. 4,725 ft.; pmp. 5 B.O. and pmp. off; to C.O.
Texas Co. No. 2-T State, C SW SE Sec. 34-17-34. Drk.
Twin Oil Corp. No. 1-D State, C SW NE Sec. 30-17-35. T.D. 4,700 ft.; S.I. 10 days and pmp. 58 B.O. and pmp. off; S.I.
Fullerton Oil Co. No. 1-A Walker, C SW NW Sec. 18-18-32. Drlg. 3,827 ft.
Phillips Pet. Co. No. 16 Santa Fe, C NW SW Sec. 5-18-35. Drlg. 4,824 ft.
Texas Co. No. 1-X State, C NE NE Sec. 3-18-34. Drk.
P. B. English No. 1 Miller, C NE SE Sec. 18-19-32 (wildcat). Drlg. 2,696 ft.
Great Western Prod. Co. No. 2 Bordages, NE SE NW Sec. 33-19-37. T.D. 3,931 ft.; acdz. and swb. 50 B.O.P.D.
Continental Oil Co. No. 4 Sanderson B-14, NE SW NW Sec. 14-20-36. Drlg. 3,525 ft.
Stanolind O. & G. Co. No. 4-B Gilluby, NW NW NW Sec. 22-20-37. Loc.
Texas Co. No. 17 Lieu-Lands, NW NW SW Sec. 19-20-37. Drlg. 2,435 ft.
Aloco Oil Co. No. 1 Carson, C SW SE Sec. 28-21-37. T.D. 3,560 ft.; P.B. 3,568 ft.; reaming 2,000 ft.
Bryant-Drilexco No. 2 State, SE SW SE Sec. 12-21-35. T.D. 3,908 ft.; tstg.
Bryant-Drilexco No. 3 State, C S½ NW SE Sec. 12-21-35. Loc.
Danglade & Clower No. 1 Corrigan, C NE SE Sec. 33-21-37. Drlg. 890 ft.
Danglade & Clower No. 1 Owen, NW SW SW Sec. 34-21-37. Drlg. 2,548 ft.
Gulf Oil Corp. No. 1-C Carson, C NE NE Sec. 33-21-37. Loc.
Gulf Oil Corp. No. 1-C Leonard, C SE SW Sec. 36-21-36. R.U.R.
Gulf Oil Corp. No. 2-B Mattern, C SE NE Sec. 31-21-37. Drlg. 3,691 ft.
Magnolia Pet. Co. No. 1 Marshall, C SE NW Sec. 34-21-37. W.O.C. 3,750 ft.
John G. Menke No. 2 Alexander, C NE NW Sec. 5-21-37. Drlg. 1,033 ft.
Francis C. Wilson No. 3 State, NW SE NE Sec. 7-21-35. T.D. 3,868 ft.; P.B. 3,690 ft.; set whipstock 3,690 ft.
Stanolind O. & G. Co. No. 4 Hill, C SW NE Sec. 6-21-37. Drlg. 3,690 ft.
J. C. Clower No. 1-B Manda, NE NE NW Sec. 28-22-37. T.D. 3,681 ft.; tstg.
Continental Oil Co. No. 1 State F-1A, C W½ SE NE Sec. 1-22-35. T.D. 3,949 ft.; P.B. 3,910 ft.; D.D. to 3,949 ft.; acdz. and F. 5 B.W.P.H., no oil.
Continental Oil Co. No. 5 State J-2, C SE SE Sec. 2-22-36. Loc.
Continental Oil Co. No. 5 State E-17, C W½ NW SW Sec. 17-22-36. T.D. 3,827 ft.; F. 393 B.O. in 11 hrs.; 14,000,000 cu. ft. gas.
Gulf Oil Corp. No. 3-E Mattern, C NW NW Sec. 12-22-36. W.O.C. 3,690 ft.
Olean Pet. Co. No. 2 Farrell, SW SE SE Sec. 22-22-37. T.D. 3,757 ft.; P.B. 3,625 ft.; C.O. 3,600 ft.
Skelly Oil Co. No. 7 Baker, C NW NE Sec. 27-22-37. Drlg. 2,930 ft.
Skelly Oil Co. No. 5 Simms, C NW SE Sec. 33-22-37. Drlg. 3,368 ft.
Texas Co. No. 2-B Fally, C SE SW Sec. 8-22-37. T.D. 3,720 ft.; P.B. 3,709 ft.; F. 17 B.F.P.D., 6% B.S.
Texas Pacific C. & O. No. 15-A State, C N½ SE NW Sec. 11-22-36. Drk.
Walter Donnelly No. 1 Davis, C SE NW Sec. 33-23-37. T.D. 3,600 ft.; tstg.
Great Western Prod. No. 2-B Leonard, C NW NW Sec. 32-23-37. Drk.
Continental Oil Co. No. 2 Jack B-37, C SW NE Sec. 27-24-37. T.D. 3,537 ft.; shot and F. 30 B.O.P.H.
Humble O. & R. No. 4 Williams, C NW NW Sec. 34-24-37. W.O.C. 440 ft.
North Shore Oil Corp. No. 3 Woolworth, SW SW NW Sec. 33-24-37. Drlg. 2,911 ft.
North Shore Oil Corp. No. 4 Woolworth, NW NW NW Sec. 33-24-37. Loc.
Parker Drlg. Co. No. 3 Erwin, C W½ NE SW Sec. 35-24-37. T.D. 3,460 ft.; F. 10 B.O. in 8 hrs.; est. 3,000,000 cu. ft. gas.
Phillips and Pure No. 5 Woolworth, C SW SE Sec. 33-24-37. R.U.R.
Phillips and Pure No. 6 Woolworth, C NE NE Sec. 33-24-37. T.D. 3,541 ft.; F. est. 56 B.O.P.H.
Schermerhorn Oil Co. No. 5 Woolworth, NW SW NE Sec. 28-24-37. Drlg. 3,405 ft.
Schermerhorn Oil Co. No. 6 Woolworth, C SW SE Sec. 28-24-37. Drlg. 2,470 ft.
Shasta Oil Co. No. 1 Woolworth, NE NE NW Sec. 28-24-37. T.D. 3,601 ft.; est. F. 10 B.O.P.D.
Weir Drlg. Co. No. 3 Woolworth, NE SW SW Sec. 28-24-37. Fsg. 3,195 ft.
Amerada Pet. Co. No. 1-B Stuart, NW SE NE Sec. 22-25-37. W.O.C. 3,299 ft.
Anderson & Prichard No. 5 Wells, C NW NE Sec. 5-25-37. Drlg. 1,240 ft.
Anderson & Prichard No. 1 Woolworth, NW NE NE Sec. 17-25-37. Drlg. 2,953 ft.
Culbertson & Irwin No. 3 Henry, SW SW SW Sec. 26-25-37. Drlg. 3,065 ft.
Italo Pet. Corp. No. 1 Carlson, SW NE NW Sec. 26-25-37. Drk.
Italo Pet. Corp. No. 3 Carlson B-27, NE SE SE Sec. 27-25-37. Loc.
Italo Pet. Corp. No. 1 Indian B-4, NE NW NW Sec. 4-25-37. W.O.C. 3,390 ft.
Italo Pet. Corp. No. 2-B N. M. Pet., SE SW NW Sec. 4-25-37. Drlg. 2,938 ft.
Phillips and Pure No. 2 Woolworth, C SE NE Sec. 6-25-37. Drlg. 3,163 ft.
Richmond Drlg. Co. No. 2-A State, C SW SW Sec. 2-25-37. Drlg. 3,257 ft.; killed; est. 12,000,000 cu. ft. gas with S.W.
Sam Weiner No. 3 Smith, C N½ NE SE Sec. 4-25-37. T.D. 3,506 ft.; C.O. 3,490 ft.

Eddy County

Allen, Fair & Pope No. 1 Snowden, SE NE SE Sec. 36-17-29. Drlg. 2,013 ft.
Aston & Fair, Inc., No. 1 Hudson, C NE NE Sec. 18-17-31. Drlg. 2,774 ft. (last report).
W. H. Berry No. 1 Berry, NE NE NE Sec. 24-17-27. Drlg. 400 ft.
Hammond & Sons No. 1 Ployhar-State, SW SW SE Sec. 16-17-28. S.D.O. 1,951 ft.
J. O. and J. H. Hammond No. 1 Paris, NE NW NW Sec. 5-17-29. S.D.O. 25 ft.
English & Harmon No. 1 Stogner, C NW SE Sec. 31-17-31. T.D. 4,252 ft.; P.B. 2,425 ft.; to test.
Flint Prod. Co. No. 1-L Dexter, SE NW SE Sec. 15-17-30. T.D. 3,466 ft.; S.D.; rprs.
F. G. Keyes No. 3 Red Gulch, NW NW NE Sec. 16-17-28. Drlg. 1,885 ft.
Ohio Oil Co. No. 4 State-McCallister, Sec. 25-17-34. W.O.C. 510 ft.
C. S. Powell No. 1 Smith, NW NW NE Sec. 6-17-29. Drlg. 2,564 ft.
Welch & Welch No. 1 State, NE NE SE Sec. 20-17-28. T.D. 1,970 ft.; C.O.; est. 35 B.O.P.D.
Repollo Oil Co. No. 5-A Parke, NW NE NW Sec. 22-17-30. Drlg. 875 ft.
Repollo Oil Co. No. 4-A Keel, SE NE SW Sec. 7-17-31. Drlg. 1,450 ft.
Repollo Oil Co. No. 3 West, NE NE NE Sec. 3-17-31. R.U. mch.
H. J. Steinberger No. 1 Hastie, SE NE SW Sec. 18-17-38. T.D. 555 ft.; tstg.
Adkinson Oil Co. No. 1 Brainard, SE SW SE Sec. 5-18-27. S.D. rprs. 1,442 ft. (last report).
Barney Cockburn No. 1 State-Graham, C NE NE Sec. 16-18-31. Drk.
Farmer & Tallmadge No. 1 Hubbell, NE SW Sec. 4-18-25. T.D. 400 ft.; fsg. bit.
Franklin Pet. Corp. No. 1 Ballard, NE NE SE Sec. 1-18-29. T.D. 2,828 ft.; pay sd. 2,780 ft.; F. 47 B.O. in 50 min.; to shoot.
Franklin Pet. Corp. No. 1 Canfield, NW NW NW Sec. 7-18-30. M.I.M.
Green Bay Oil No. 1-A Johnson, C SE SE Sec. 11-18-31. T.D. 3,775 ft.; top pay 3,454 ft.; 650 ft. O.I.H.
Harvey E. Yates No. 1 Travis, NE SE SE Sec. 6-18-29. S.D.O. 2,425 ft.
H. W. Martin No. 1 Gates, SW SE SE Sec. 15-18-30. Loc.
Martin Yates No. 1 Saunders, NE NE NE Sec. 12-18-29. R.U. mch.
Carper Drlg. Co. No. 1 Quillen, C NW NE Sec. 12-19-31. S.D.O. 2,765 ft.
Geo. E. Robb No. 1 Cannon, C SW SE Sec. 4-19-30. T.D. 210 ft.; S.D.O.
Geo. E. Robb No. 1 Vandagriff, SW NE Sec. 6-19-31. T.D. 800 ft.; S.D.O.

R. C. Underwood No. 1 Quillen-Bruce, NE NE SE Sec. 4-19-31. Drlg. 3,436 ft.
Martin Yates, Jr. No. 1 Bowers, SW SE SE Sec. 31-19-27. T.D. 1,180 ft.; est. 25-40 B.O.P.D.; tstg.
Trojan Oil Co. No. 1 Grant, SW SW NE Sec. 33-20s-25e. S.D.O. 408 ft.
C. F. Ingram No. 1 Page, NE NE SW Sec. 15-21-28. T.D. 2,978 ft.; fsg.
Barnett Oil Dev. Co. No. 1 King, C NW SE Sec. 23-26-30. Drlg. 2,750 ft.

Chaves County

Nay Hightower No. 1 Billingslea, C SW NE Sec. 28-11-30. Drlg. 3,227 ft., L.
New, Russell & Wood No. 1 Sterrett (wildcat), NW SE NW Sec. 29-11-25. Drlg. 150 ft.
Tarkenton Bros. No. 1 Peters, SE SE NW Sec. 33-11-25. Drlg.
Western Minerals, Inc., No. 1 Dow (wildcat), C SW NW Sec. 27-10-30. Loc.

De Baca County

N. E. Woods No. 1 Jones, C NE SW Sec. 17-4n-20. T.D. 620 ft.; S.D. rprs.
James D. Ward No. 1 Summers, SE NE SW Sec. 15-4n-24e. T.D. 680 ft.; S.D.O.

Roosevelt County

Shell Pet. Corp. No. 1 Harwood, C S½ SE SE Sec. 27-7s-35e. Drlg. 6,884 ft., sh.

NORTHWEST NEW MEXICO

Bernalillo County

Norins Realty Co., Inc., No. 2 Pajarito, Sec. 22-9n-1e. S.D. 1,100 ft.

San Juan County

Continental Oil Co. No. 88 Rattlesnake, CNL NE NE Sec. 2-29n-19w. T.D. 730 ft.; cmtd. 7-in. 727 ft.
Jack Amenda No. 1 Schenck, NE NE Sec. 14-29n-13w. Drlg. 650 ft.

COLORADO

Archuleta County

The Axelind Oil Co. test in the Price district was deepened to 2,465 feet, where it was still in the Dakotas, and shut down until spring.

Axelind Oil Co. No. 1, approx. NE NW Sec. 12-32n-2e. S.D. 2,465 ft. until spring.

Boulder County

Reynolds & Rohr No. 1 Thomas, SW SW Sec. 17-1n-70w. Drlg. 1,410 ft.

Fremont County

Waterville Oil Co. No. 1 Persons, CWL NE NE Sec. 17-18s-69w. Spdg. 20 ft.

Moffat County

The Mountain Fuel Supply Co. No. 1 Florence Wilson, NE SW NE Section 22-12n-100w, Hiawatha field, was recompleted at 2,606 feet for 5,000,000 cu. ft. of gas per day in sand in the Wasatch after deepening from 2,232 feet. At last-named depth it was recompleted in 1932 for 1,000,000 cu. ft. of gas and 15 bbls. of oil per day after deepening from 2,220 feet, where it was completed as a discovery in 1926 for 45,000,000 cu. ft. per day. Last deepening operation was to test the oil sand in No. 1 Kuykendall, which averaged 85 bbls. per day.

MacKinnie Oil & Drlg. Co. No. 1 Coles, SW SW SE Sec. 1-3n-92w. Drlg. 3,160 ft.; will lower 6¼-in. to around 3,200 ft. for F.S.O.

Park County

South Park Oil Co. No. 1 Leman, NE NE SE Sec. 34-11s-75w. Drlg. 8,633 ft.

Pueblo County

Eden O. & G. Co. No. 1 Horse Creek, SW SE Sec. 29-19s-64w. T.D. 2,060 ft.; prep. to run 4½-in. to carry.

WYOMING

Albany County

G. R. McConnell-J. L. Gaylord No. 1 Fuller, NW NE NE Sec. 7-15n-75w. Drlg. 995 ft.; Muddy at 868-905 ft.; hard, tight and dry.

Big Horn County

Yale Pet. Corp. No. 2 Yates, Lot 57 (NW SW) Sec. 34-56n-97w. Drlg. 170 ft.; 15½-in. at 40 ft.
Mule Creek Oil Co. (formerly Yale Pet. Corp) No. 1 Sessions, Lot 53 (NW NW) Sec. 34-56n-97w. R.U.
A. L. Rankin No. 1 Karjala-Rankin, C SW NW Sec. 10-54n-94w. Drlg. 660 ft.

Carbon County

Sinclair-Wyo. Oil Co. No. 2-A Mahoney Unit, C SW NE Sec. 34-26n-88w. T.D. 4,326 ft.; fsg. 115 ft. D.P. twisted off.
Producers Oil Co. No. 1 Lake Valley, CNL Sec. 14-20n-88w. Drlg. 1,940 ft.

Fremont County

H. Kenyon Burch No. 9 Tribal, C NW NW Sec. 27-3n-1w. Drlg. 1,175 ft.
Frank Pouppirt No. 2 Fidelity Tr., NW NW SW Sec. 27-3n-1w. Drlg. 1,120 ft.; 10-in. 125 ft.
Lincoln O. & G. Co. No. 5 Tribal, C SW SE Sec. 23-1s-1e. Cmtd. 6⅝-in. 125 ft.; W.O.C.

Lincoln County

H. C. Harris et al No. 1 Govt., SE NW NW Sec. 23-21n-117w. Drlg. 1,570 ft.

Natrona County

The General Petroleum Corp. No. 1 State, NW NE SE Section 16-35n-77w, 1¼ miles north of the discovery on Cole Creek, was dry at 8,707 feet, 1 foot in the red beds. The Sundance at 8,639-8,706 feet (corrected), had good porosity and permeability, but contained no oil or gas. It was not tested for water. It defines the limits of the structure on the north. The discovery, which was completed last June, made 250 bbls. initially from the Lakota at 7,974-8,013 feet. It may be deepened in the coming spring.

The Summit Oil Co. is spudding in on its second test on the North Platte structure, 5 miles west of Casper, in its No. 2 Government, NW NE NE Section 21-33n-80w. Location is three-fourths of a mile east of its No. 1 Government, which was abandoned in 1937 at 2,055 feet after testing the Sundance.

Summit Oil Co. No. 2 Govt., NW NE NE Sec. 21-33n-80w. Spdg. 26 ft.; (first report).
Richland Corp. No. 1 State, SW NW Sec. 36-36n-81w. R.U.C.T.

Niobrara County

The Ohio Oil Co. No. 5 Agnes Rohlff, 110 feet east of C E half Section 32-36n-65w, an inside well in the northern part of the Lance Creek field, was completed at 3,933 feet in the Sundance at 3,825-3,920 feet. The 7-inch was cemented at 3,846 feet. On March 10 it flowed 155 bbls. and began to increase. Last test was 190 bbls. flowing and swabbing in daylight hours only.

Location has been released for an important test to Leo sand out from the developed area in the Minnelusa Oil Co. and MacKinnie Oil & Drilling Co. No. 5 Thompson, in the SE SE NW Section 7-35n-65w. It is one-fourth of a mile west of the MacKinnie No. 4 Thompson, a good producer in the Leo, and half a mile south of MacKinnie No. 2 Thompson. According to a new structural map of Lance Creek contoured on the Leo sand, published by Petroleum Information, Inc., of Denver, on geology by C. E. Shoenfelt, this location is well within the productive limits. This map, which is based on well log data, shows the contours to the northeast which were omitted on previous maps awaiting completion of drilling wells in the area to supply subsurface data. The No. 5 Thompson will be drilled with rotary and Manning & Martin, Inc., have the contract.

The J. E. Manning test on the Hewitt permit, on the southeastern flank, for which location was released last fall, will begin spudding about April 1.

F. F. Hintze and others No. 1 Wright-Government, on Buck Creek, to the east of Lance Creek, was drilled to 4,964 feet and will plug back and test 15 feet of saturated Dakota sand. It had the top of the Muddy at 4,160 feet; the Dakota at 4,235 feet; and the Sundance at 4,743 feet. Rotary table elevation, 4,428 feet.

The Argo Oil Co. has a near-completion in its No. 3 Ford, a Sundance sand well being deepened to the Leo. It had the red marker at 5,145-69 feet, top of the sand at 5,237 feet, and saturation at 3,245 feet.

J. E. Manning No. 1 Hewitt-Govt., NW SW SW Sec. 4-35n-65w. Prep. to spd.
Minnelusa Oil Corp.-MacKinnie O. & D. Co. No. 5 Thompson, SE SE NW Sec. 7-35n-65w. Loc.; (first report).
Ohio Oil Co. No. 3 Agnes Rohlff, C SE NE Sec. 32-36n-65w. Drlg. r.b. 4,181 ft.
Continental Oil Co. No. 3-B Dielman, SW SE NW Sec. 8-35n-65w. Rig; W.O. equip.
Ohio Oil Co. No. 11 Putnam, SE SE SW Sec. 33-36n-65w. Loc.
Continental Oil Co. No. 2 E. Rohiff, NW SE NW Sec. 32-36n-65w. Drlg. 2,392 ft.
Minnelusa Oil Corp. No. 2 Joss, SE NE SW Sec. 6-35n-65w. T.D. 3,989 ft.; pulling tbg. to D.D.
Minnelusa Oil Corp. No. 3 H. & M.-5, NW NE SE Sec. 7-35n-65w. Drlg. 3,610 ft.; top Dakota 3,592 ft.; (formerly No. 1).
Argo Oil Co. No. 3 Ford, SW SW NW Sec. 33-36n-65w. Cg. 5,257 ft. in sat. Leo sd.
F. F. Hintze et al No. 1 Wright-Govt., C NW SE Sec. 30-36n-63w. T.D. 4,964 ft.; P.B. to Dakota to tst.
Fall River Roy. & Prod. Co. No. 1 Govt., CSL SE SE Sec. 35-40n-61w. T.D. 1,000 ft.; fsg. bailer.

Sublette County

Texas Co.-Frontier Pet. Co. No. 1 Govt. Unit, SE SE SW Sec. 1-28n-114w. T.D. 6,247 ft.; redrld. to 5,613 ft.; cmtd. 7-in. at 5,607 ft. with 200 sacks; W.O.C.

Sweetwater County

Sinclair-Wyo. Oil Co. No. 83 Lost Soldier, NW NE NE Sec. 10-26n-90w. R.U.R.
Sinclair-Wyo. Oil Co. No. 82, NE SW SW Sec. 11-26n-90w. T.D. 2,214 ft.; cmtd. 5½-in. 2,213 ft.; W.O.C.

MONTANA

Carbon County

Alex Beaton No. 1, CSL SE SE Sec. 23-6s-23e. Drlg. 1,596 ft.
Miracle Oil Co. No. 2 Govt., CWL NE SE Sec. 3-6s-23e. T.D. 2,340 ft.; fsg. tools.

Glacier County

There were no completions or new operations in Cut Bank.

Tarrant-Wiley No. 3 Jones, SW NW SW Sec. 31-34n-5w. R.U.
Tarrant-Long No. 7 Miller, NE SW NE Sec. 24-34n-6w. Drlg. 950 ft.; Colo. 470 ft.; 10¾-in. 480 ft.
Glacier Prod. Co. No. 1 Bliesener Unit, SE SE NE Sec. 3-33n-5w. Drlg. 1,500 ft.
Glacier Prod. Co. No. 4 Simero, C NE NW Sec. 5-33n-5w. T.D. 2,385 ft.; fsg. tools.
Yukon Oil Co. No. 2 Lungren, C NE NW Sec. 26-37n-5w. Drlg. 1,250 ft.; Colo. 409 ft.; 13-in. at 422 ft.
Santa Rita O. & G. Co. No. 9 Tribal, NE SE NE Sec. 16-35n-6w. Drlg. 2,540 ft.
Wm. Hanlon No. 4 All.-128, SW SE NE Sec. 12-32n-6w. Drlg. 2,175 ft.
Glacier Prod. Co. No. 2 Scheuren, C SW SW Sec. 20-33n-5w. Drlg. 3,046 ft.; 7-in. at 3,038 ft.

Petroleum County

H. Clark Rowland No. 1 Brundidge-Mink, SE NW Sec. 35-14n-25e. Drlg. 325 ft.

Pondera County

Morton-Cloutier No. 1 Hagan, C SE SE Sec. 5-31n-7w. T.D. 450 ft.; fsg. tools.

Teton County

Zodiac Oil Co.-Gulf States Oil Co. No. 1 Kellogg, NE NW NE Sec. 33-28n-5w. Drlg. 2,470 ft.

Toole County

The International Refining Co. announced this week that it will increase purchases of Kevin-Sunburst crude from its connections from one-third of well potentials to 43 per cent. This action, with a better outlook for spring demand by local skimming plants and probable takings of several hundred barrels daily by the new refinery at Cut Bank, if the processing agreement is consummated, makes prospects much better for the producers this spring. Most of the Cut Bank crude is now under contract and some of the small plants obtaining their supply from that field are expected to turn back to Kevin-Sunburst for their crude.

There were no completions or new operations in Kevin-Sunburst.

G. & A. Oil Co. No. 14 Goeddertz, NE SE SW Sec. 23-35n-3w. Loc.
A. E. Crumley & Son No. 15 Fryberger, NE NW SE Sec. 24-35n-3w. Drlg. 1,240 ft.
Big West Oil Co. No. 10 Gunderson, 1,980 ft. from WL and 1,100 ft. from NL, Sec. 19-35n-2w. T.D. 1,610 ft.; contact 1,608-10 ft.; small S.O.; will acd. later.
Fulton-Commonwealth No. 2 Thompson, SE NW SE Sec. 28-35n-3w. Drlg. 1,460 ft.
G. M. Plotke No. 2 Ward, SW cor. Sec. 28-35n-3w. T.D. 1,642 ft.; cmtd. 7-in. on bttm.
Kippen O. & G. Co. No. 1 Thompson, C NE SE Sec. 28-34n-1e. Spdg. 160 ft.
Coolidge & Coolidge No. 3-A State, NW NE NW Sec. 36-36n-2w. Drlg. 1,320 ft.

UTAH

Cane Creek Oil Co. No. 1 Govt., NW SW Sec. 31-26n-21e. Drlg. blk stky. sh. 3,170 ft.; S.G. through H.F.W.

Oklahoma Fields

(Continued from Page 125)

Stanolind Oil & Gas Co. No. 3 Norris E, NE SW SE Section 25-2n-6, an old well, was deepened from 4,285 feet to 4,375 feet, produced 42 bbls. of oil daily and was recompleted.

Lincoln County

Cooper Drilling Co. No. 7 School Land, SW NE NE Section 16-14-6, Sac and Fox pool, Lincoln County, was bottomed at 3,147 feet and produced 240 bbls. of oil in 24 hours, initially, from Prue sand.

Same company's No. 8 School Land, NW NE NE Section 16-14-6, topped Prue sand at 3,035 feet, total depth 3,155 feet, was shot with 360 quarts and pumped 184 bbls. of oil daily.

Wilcox Oil & Gas Co. No. 25 Sac and Fox, NW SE SE Section 16-14-6, found Prue sand at 2,961 feet, total depth 3,066 feet, was shot with 300 quarts and had initial daily yield of 158 bbls. of oil.

Oklahoma County

Ohio Oil Co. No. 3 Keefer, Account 1, NE NW NW Section 5-13-3w, Edmond field, Oklahoma County, flowed 150 bbls. of oil daily from Wilcox sand and was completed at 6,712 feet, total depth.

Creek County

L. B. Jackson No. 11 Wills, SE NW NW Section 26-18-8, Olive area, Creek County, pumped 15 bbls. of oil daily and was completed at 2,686 feet, total depth.

Kessler Oil & Gas Co. No. 1-B Cartright, NW NE NE Section 29-18-9, had initial yield of 105 bbls. of oil daily at 2,891 feet, total depth.

Big Four Petroleum Co. No. 2 Vance, NE NE SW Section 24-19-7, was bottomed at 2,763 feet and pumped 12 bbls. of oil in 24 hours. Same company's No. 2 Copeland, an old well, was deepened to 2,785 feet and pumped 8 bbls. of oil daily.

Bert Swift No. 1 Lamp, SE SW NE Section 10-18-8, was dry and abandoned at 2,933 feet, total depth.

Fogle and others No. 1-A Replogle, NW NW NE NE Section 36-19-7, was dry and abandoned at 2,661 feet, total depth.

Central Commercial Oil Co. No. 2 Bruce A, NW SW SW Section 15-17-9, had Bartlesville sand at 2,442 feet,

total depth 2,461 feet, was shot and pumped 60 bbls. of oil daily.

Beal & Berryhill No. 1-A Tiger, NW NW SW NE Section 16-14-10, was shot and produced 36 bbls. of oil in 24 hours, completed at total depth of 2,708 feet.

Muskogee-Okfuskee Counties

W. A. Fleming No. 2-A Scott, NE SW NE Section 25-10-11, was a machine. M. M. Hourigan No. 1-A Hudson, SW SW SW Section 1-11-8, was a location. They are in Okfuskee County.

J. H. Parks No. 1 Hildebrand, NW NE NE Section 20-14-19, Muskogee County, was a machine.

Hughes County

Olsen and others No. 1 Peebles, SE SE SW Section 29-8-9, North Holdenville area, Hughes County, was dry and abandoned at 3,635 feet, total depth.

Okmulgee County

R. F. Harmon completed a 2-bbl. well at No. 4 Grayson, NE SW NE Section 20-12-12, Okmulgee County. Total depth was 1,953 feet.

W. B. Pine No. 1-A Duff, SW SW SE Section 11-14-12, was dry and abandoned at 2,175 feet, total depth.

New work in Okmulgee County: Dan Smith No. 1 Neff, SW SW SW Section 31-12-14, drilling below 1,220 feet; Oklahoma Oil Corp. No. 3-A Smith, NW NE SE Section 17-13-11, cellar and pits; B. H. Young No. 1 Moore, NE SW NE Section 31-13-14, machine; M. F. Craig No. 7 Cover, C SW NE Section 25-14-14, machine; F. D. Misener No. 2-A Jefferson, NE SW SW Section 23-15-14, machine.

Tulsa-Pawnee Counties

A 7-bbl. pumper was completed by A. Peppis at No. 8 Bishop, CWL SE SW Section 35-19-12, Tulsa County. It was bottomed at 1,368 feet.

A. D. Whitten No. 2 Fulsom, NW NW SE NE Section 24-19-11, Tulsa County, was dry and abandoned at 1,059 feet, total depth.

Sinclair Prairie Oil Co. No. 11 Berger B, C N half S half NE SE Section 17-21-8, Pawnee County, an old well deepened, was dry and abandoned at 1,800 feet, total depth.

Osage County

Kansas-Oklahoma Consolidated Co. No. 18 Osage, SW SE NE Section 21-29-11, Osage County, had Peru sand at 663-1,000 feet, total depth 1,014 feet, and pumped 12 bbls. of oil daily, with some water.

Same company's No. 19 Osage, NW SE NE Section 21-29-11, pumped 8 bbls. of oil daily from Peru sand at 952-1,002 feet, total depth 1,022 feet.

New activity in Osage County: Tide Water Associated Oil Co. No. 6 Osage, SE NW SW Section 21-24-9, location; Indian Territory Illuminating Oil Co. No. 464 Osage, NE SW SE Section 35-26-11, drilling below 400 feet; Sinclair Prairie Oil Co. No. 67 Osage, C S half NW SE Section 12-21-8, location; Kansas-Oklahoma Consolidated Oil Co. No. 20 Osage, NE SE NE Section 21-29-11, location.

Southwestern Oklahoma

Ohio Oil Co. No. 5 Lackey, NW SW NW Section 11-5-9w, Cement field, Caddo County, found sand at 3,390-3,421 feet, total depth 3,422 feet, and flowed 414 bbls. of oil in four hours, or 2,484 bbls. daily, with 2,000,000 cu. ft. of gas daily.

Ray Stephens No. 1 Heuron, SE SW NW Section 26-6-10, Caddo County, had sandy shale at 2,353-63 feet, was bottomed at 5,528 feet, plugged back to 3,570 feet and pumped 25 bbls. of oil in 24 hours.

In Comanche County, Wichita Oils, Inc., No. 8 Pope, NE NE SW Section 28-2n-10w, Lawton area, was dry and abandoned at 470 feet, total depth.

In Grady County, T. H. McCasland No. 1-A Ridley, NW NE SW Section 8-3n-5w, Knox field, found salt water at 2,920 feet, total depth, and was abandoned.

In Stephens County the following wells were completed: Mudge Oil Co. No. 18 Crosbie, SE NE SW Section 23-1s-5w, Velma area, total depth 645 feet, pumped 25 bbls. of oil daily from sand at 634-43 feet.

Carl Carter No. 3 Warden, NE SE NW Section 34-1s-5w, had sand at 675-89 feet, total depth 713 feet, and pumped 12 bbls. of oil daily.

George L. Pace No. 10-B Houston, SE NE SW Section 2-2s-8w, pumped 15 bbls. of oil daily from sand at 1,548-60 feet, total depth.

New operations: George L. Pace No. 11-B Houston, SW NE SW Section 2-2s-8w, Stephens County, drilling; McCallister No. 3 Wade, SW SW NE Section 11-2s-8w, rotary rig; Mudge Oil Co. No. 19 Crosbie, SE NE SW Section 23-1s-3w, Carter County, spudded; Raisen Brothers No. 1-A Carter, NW NW NE Section 16-4s-3w, Carter County, drilling below 160 feet.

California Fields

(Continued from Page 124)

oil per day from 4,616 feet. Top of the Monterey was logged in No. 8 Vicente at 4,483 feet and top of the Franciscan basement was logged in No. 11 Union Sugar at 4,600 feet. Continental Oil Co. is putting the finishing touches on No. 10 Grubb in the San Miguelito field of Ventura County at 7,035 feet and should be in a position to make a production test within the next few days. Derrick has been completed and rotary drilling tools are being rigged up in No. 11 Grubb preparatory to an early spud. This development work has been of interest for several years because it is entirely possible that the production being developed by Continental Oil Co. on the Grubb lease may not be coming from the San Miguelito field, but may on the other hand be coming from productive measures of the Ventura Avenue field.

San Joaquin Basin

Belridge Oil Co. completed two small wells in the North Belridge field of Kern County this week and both required artificial stimulation. These new wells were No. 25 in Section 26-27-20, finished flowing 320 bbls. of 31.9-gravity oil cutting 30 per cent, and No. 26-A in Section 35-27-20, finished flowing 290 bbls. of 32.8-gravity oil cutting 3 per cent. Both wells were completed on gas lift and the large cut shown by No. 25 may result in additional work. No. 25 was finished at 8,500 feet and No. 26-A was finished at 8,750 feet, both wells having been bottomed in the Wagonwheel zone of Eocene age. Texas Co. No. 2 Martin, located far out on the west flank of the North Belridge structure, went to water and the company is undertaking some remedial work.

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1—Unexcelled for bad sand conditions;

2—5 to 13 per cent more fluid is handled;

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5—Runs are exceptionally long because of its durability.

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B-M-W Products are obtainable at supply stores: ● TEX TYPE Plunger Fittings and Valves; ● ADMORE Insert Pump Anchors; ● NEILSON Tools (Safety Sucker Rod Hooks, Tubing Hooks, Rod Elevators, Sucker Rod Sockets, etc.); ● BALLS and SEATS (Made for every pumping service); ● ADMORE Liner Barrels; and ● COLLINS Belt Clamps.

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If you have not read about the new B-M-W TOWER TYPE BALL & SEAT and the new B-M-W 2-WAY NON-MAGNETIC CROWN —we shall be glad to send complete data.

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Michigan Field Report

By O. C. PRESSPRICH

Well in Freeman Pool Makes New State Production Mark

SAGINAW, Mich., Mar. 20.—The Freeman-Redding oil field of Clare County, scene of the state's most orderly and controlled oil development in Michigan, produced the major sensation of the week in state oil circles—a record producer.

The well flowed 772 bbls. naturally in one hour and 50 minutes, but optimistic oil men in the field gave it as their opinion that it could flow 12,000 bbls. a day, basing their estimate on the last 50 minutes' production during which time it poured out 420 bbls. of crude. The rated potential of the previous best producer in Michigan was 10,000 bbls. a day.

The well is Basin Oil Co. No. 4 Van Horn, SW SW NE Section 4, of Freeman Township (18n-6w). Goll, Graves & Mechling, the drilling contractors, announcing completion on Thursday, said the pay was topped at 3,872 feet where the well began to flow 30 bbls. an hour. During the drilling-in to a total depth of 3,882 feet the well flowed 352 bbls. the first hour and 420 bbls. in the next 50 minutes or a rate of 504 bbls. an hour which, computed on a 24-hour basis, would mean a production of 12,096 bbls. The well was pinched in immediately and production cut to the 200-bbl. daily allowable for the field.

Of the week's 22 reported completions, which included two gas wells, nine were in Van Buren County, where the intensive development is continuing without signs of a letdown. Causing some concern was the announcement of one carrier of another 10-cents-per-barrel cut in its posted price for Kent and Van Buren County crudes. The new posted price is 68 cents a barrel, the slash being attributed generally to the fact that no control is being exercised over the state's most prolific field. The 68-cent posted price, however, does not reflect the true price picture in that area. Outlets are at a premium and well owners in some instances have practically given away their oil as the alternative to shutting down their wells. It was problematical whether an announcement that the Midwest Refinery of Alma is entering the western Michigan competition for the cheap oil would have any tendency to check the decline. Midwest, it was reported, has purchased the Imperial Refinery at Grand Rapids. The western Michigan price cut was not reflected in the quotations for crude in the central and northern Michigan field, but operators were none too optimistic that current prices there would hold.

The week's completions increased Michigan's potential daily oil output by more than 20,000 bbls. Basin Oil Co.'s record well is about 3 miles north of the Freeman discovery. An offset is being drilled for C. L. Maguire, of Roosevelt Oil Co. A southeasterly extension of the Bloomingdale-Mill Lake field, C. C. Goff No. 1 Miller, NW NW NE Section 24, Bloomingdale, was indicated by another completion. That well was reported flowing naturally at 27 bbls. an hour.

Forecasts of a profitable Kent County field were at least partly verified as Smith Petroleum Co.-Gerald Wagner Trust completed the No. 2 Whalen, SE SE SW Section 32, Walker Township, which produced at a rate of better than 100 bbls. an hour, with the aid of an acid treatment. Eight other wells are drilling in that area and there were indications of considerably greater activity as the Michigan price situation apparently failed to dampen enthusiasm. New drilling permits issued during the week by the State Conservation Department included two for Walker Township and two for wildcat tests in Kent's Wyoming Township. Van Buren County pools went ahead with their usual cluster and Pure Oil Co. took four for its Redding Township development in Clare County.

More exploratory tests were indicated as permits were issued for wildcats planned in three counties—Otto Township of Oceana, Roscommon Township of Roscommon and Fort Gratiot Township of St. Clair County. There were three other permits for Allegan County, a gas well permit for Home Township of Montcalm County, where one of the week's two gas wells was completed, and for another well in Wise Township of Isabella County.

Summary of the week's completions in Michigan:

Allegan County

Overisel Township (4n-14w)—Two successful completions were recorded in Section 27. Fortney Oil Co. and W. Spencer Cook No. 2 John J. Hoeve, NE SW NW, was acidized to an estimated daily output of 300 bbls., being completed at a depth of 1,468 feet, while Stewart Oil Co. No. 1 Sena Kruithof, SW NE NW, appeared to be a much better well. Natural flow during the first nine hours was 385 bbls. The well's total depth is 1,461 feet.

Calhoun County

Pennsfield Township (1s-7w)—Veronica Crude Oil & Gas Co. drilled its No. 1 Fruin, NE SW NE Section 29, down 2,915 feet and abandoned the test as dry.

Clare County

Freeman Township (18n-6w)—Basin Oil Co.'s state record production well, No. 4 Van Horn, SW SW NE Section 4, was shut down to the field's allowable 200 bbls. daily after completion at a depth of 3,882 feet.

Redding Township (19n-6w)—Pure Oil Co. completed another good well, while a second completion in the field was a failure. Pure's No. 3-A Berton A. Switzer, S half NE SW Section 27, completed at a total depth of 3,908 feet, produced at the daily rate of 850 bbls., naturally. The Gulf Refining Co. No. 2 Arthur, NW SE SW Section 34, was abandoned as dry at 3,923 feet.

Gladwin County

Beaverton Township (17n-2w)—Sun Oil Co. abandoned No. 1 Tuckerman, E half NE NE Section 2, after drilling to 3,998 feet.

Bentley Township (17n-2e)—The Louis Rose-D. J. Jones 3-A State of Michigan, SW NW SE Section 20, swabbed 10 bbls. at 3,537 feet.

Isabella County

Sherman Township (15n-6w)—Appearance of a small quantity of water cut into the prospects for Pure Oil Co. No. 6 George A. Baker, SW NW NW Section 33, which was completed at 3,654 feet. Acidized, the well produced 300 bbls. of oil the first day, but second day production was about half, with water rated at nearly 6 per cent.

Kent County

Walker Township (7n-12w)—The Smith Petroleum Co. and Gerald Wagner Trust No. 2 Edmund Whalen, SE SE SW Section 32, bore out earlier expectations for the new Kent County development. Completed at 1,820 feet, its natural production in the first 12 hours was 200 bbls. of oil. After getting an acid treatment production increased to 925 bbls. in 19 hours. In the same Section 32, No. 1 Yost & Huntly, NE SW SE, owned by the Wolverine Natural Gas Corp., was completed as a gas well with a rated 3,000,000 cu.-ft. daily capacity. The well was drilled to 1,149 feet.

Van Buren County

Bloomingdale Township (1s-14w)—Eight of the nine completions in the prolific Bloomingdale field ranged in potential daily production from 200 to 800 bbls., and increased the field's daily production by more than 4,000 bbls. William M. Rowe and George Kernodle No. 2 Bert Decker, NE SE SE Section 7, had a natural production of 500 bbls. daily, which was increased to 800 bbls. after the well was acidized on completion at a total depth of 1,210 feet. Marshall H. Bauman No. 2 Thomas Rogers, NE SW SW Section 8, completed at 1,222 feet, was producing 250 bbls. daily after being treated with acid. Howard Fowler No. 4 Ida Melvin, SW SW SE Section 8, was acidized after completion at 1,200 feet to an estimated daily production of 200 bbls. Fisher & McCall Oil & Gas Co. completed No. 2-C Wiggins, NE NW NW Section 16, at 1,209 feet. The well's production after being acidized was rated at 800 bbls. daily. Best producer of the week in Bloomingdale was the R. T. & E. Corp. and H. R. Allen No. 2 Charles J. Clinkenbeard, NE NW NW Section 17, which doubled natural production following acid treatment at 1,215 feet. Output totaled 800 bbls. in the first 10 hours thereafter. C. C. Goff No. 1 Loveless, SW NE NE Section 24, still dry at 1,482 feet, was abandoned. C. C. Goff No. 1 Miller, NW NW NE Section 24, a southeasterly extension of the Bloomingdale-Mill Lake field, flowed naturally at the rate of 27 bbls. an hour.

Columbia Township (1s-15w)—A dry hole and a producer were completed in Columbia. The dry hole was Cryden Petroleum Co. No. 1 Nepper, NE NW SE Section 10, abandoned at 1,208 feet. W. S. Westbrook and James Jennings No. 1 C. N. Strong, SW NE NE Section 11, completed at 1,168 feet, produced at a 500-bbl. daily rate after being treated with acid.

Montcalm County

Home Township (12n-6w)—A sizeable gas well, its capacity gauged at 7,800,000 cu. ft. daily, was completed by L. T. Barber. The gasser, drilled to 1,315 feet, is No. 1 V. Matherson, NE SW NW Section 23.

St. Clair County

Port Huron Township (6n-17e)—The search for oil by Huronic Oil Co. was temporarily abandoned after drilling of No. 1 Adam May, SW SW NW Section 4, to a depth of 674 feet.

A State Land Lease Sale

More than 38,000 acres of state-owned land, much of it in territory beginning to be rather intensively prospected by wildcatters, will go on the oil lease auction block April 10, on orders of the Michigan conservation department. The biggest single slice of acreage is 11,076 acres in Hillman Township, Montmorency County.

The state offers the land on lease to the highest bidder, exacting the customary one-eighth royalty on unproved lands, one-fourth on proved lands.

Counties, townships, and number of acres to be offered are as follows:

Alcona County, Millen Township, 1,400; Gustin, 386; Mikado, 840. Arenac, Moffatt, 1,920. Bay, Winterfield, 1,031. Crawford, South Branch, 833; Grayling, 680. Gladwin, Tobacco, 639; Beaverton, 2,041; Buckeye, 2,061; Grant, 280; Gladwin, 440; Sage, 562; Butman, 669. Mason, Logan, 240. Midland, Porter, 8,046; Lincoln, 418; Hope, 577; Mills, 1,660; Edenville, 700; Larkin, 341. Missaukee, Richland, 454; Caldwell, 1,889. Montmorency, Avery, 2,600; Hillman, 11,076. Ogemaw, Foster, 3,001. Osceola, Hartwick, 748.

Gas Experiments Made

EDMONTON, Alberta.—Experiments with gas and naphtha, designed to increase crude oil and naphtha recoveries and reduce gas wastage and production costs are being conducted at the University of Alberta by Dr. E. H. Boomer, chemistry professor.

New York-Penna. Gas Fields

COUDERSPORT, Pa., Mar. 18.—The past week in the Oriskany sand gas fields in the New York-Pennsylvania area was featured by the spudding in of three more tests in the new Cameron Township, Steuben County, New York, pool. Belmont Quadrangle Drilling Co. spudded in on the Andrew Taft farm, New Penn Development Co. on the Sylvia Allen and others farm, and New York State Natural Gas Co. on a farm not named. In addition New York State Natural Gas Co. is drilling at 2,420 feet on the William Preece farm and Hanley & Bird have a location on the Lloyd Hall farm.

Sylvania Corp. drilled into the Onondaga at 4,107 feet and set casing at 4,118 feet on the Della Calhoun farm in Woodhull Township, Steuben County. New York State Natural Gas Co. is drilling at 2,390 feet on the Parks No. 3 Hanley & Bird, at 310 feet on the Woodward No. 2, and G. L. Cabot, Inc., has staked a new location on the Neva Husted farm in this township.

Other Steuben County, scene of all current New York drilling, operations are in Greenwood Township where G. L. Cabot, Inc., has the rig up on the L. Highland farm; in Troupsburg Township, where New Penn Development Co. and others are drilling at 2,420 feet on the E. G. Cady farm; and in Thurston Township, where Rehler and others are moving in for a wildcat test on the Foster estate.

Outside of the staking of a new location by the Empire Producing Co. on the Nelson Kemp farm, there are no new developments in the Sharon Township, Potter County, field opened last December and since proved by the successful completion of a second well. G. L. Cabot, Inc., is drilling at 4,694 feet on the Plank School farm where the top of the Onondaga was reached at 4,669 feet, deepest of the current operations.

In the others Empire Producing Co. is drilling at 4,476 feet on the F. Dickerson farm after passing the Tully at 4,185-4,229 feet; Sylvania Corp. at 3,950 feet on the Elmer Kemp farm; New Penn Development Co. at 3,898 feet on the Gorton-Kemp farm; Belmont Quadrangle Drilling Co. at 3,781 feet on the Wolcott No. 2; New Penn Development Co. at 1,205 feet on Dunshie farm; and G. L. Cabot, Inc., at 1,160 feet on the Reva Kemp farm. New Penn Development Co. is building the rig on the E. J. Davis farm.

Penn York is moving in on the William Cobb farm, a new operation in comparatively active Bingham Township. New York State Natural Gas Co. is drilling at 4,734 feet after passing the Tully at 4,466-4,515 feet on the F. McCarthy farm; Sylvania Corp. at 3,000 feet on the Harrison No. 2; New York State Natural Gas Co. at 865 feet on the Ladd estate and Updegraff at 400 feet on the Norman Patterson farm.

Evjen, Harris and others are shut down at 3,010 feet on their wildcat on the A. R. Mitchell farm, Sweden Township; G. L. Cabot, Inc., is drilling at 5,280 feet on the William Cobb farm, where the Tully was found at 5,047-5,100 feet, in Allegany Township, and Cunningham Natural Gas Co. is drilling at 1,617 feet on the F. Markey farm in Oswayo Township. The wildcat of the Penn Bradford Oil Co. on Warrant 5574 in Hamilton Township, McKean County, is shut down at 4,145 feet, 2 feet below the Oriskany, which showed neither gas nor salt water.

Kentucky Fields

(Continued from Page 116)

cu. ft. gas well, total depth 3,028 feet, in Corniferous lime.

Columbian Fuel Co. No. GW-831, Tierney Land Co. No. 12, on Coburn Branch in Pike County, started at 501,000 cu. ft. of gas daily, total depth 1,926 feet, in Maxon. The same company drilled a dry hole in No. GW-829, Georgia A. Johns land, in the same vicinity, at 1,835 feet.

United Carbon Co. No. 2 Republic Steel Corp No. 779, on Greasy Creek in Pike County, total depth 3,794 feet, in Big lime, started with 103,000 cu. ft. of gas daily.

Penn Fitzpatrick completed No. 1 Stephen Fitzpatrick on Middle Creek in Floyd County at total depth of 1,889 feet, good for 200,000 cu. ft. of gas per day.

Mid-City Gas Co. No. 2 R. H. Fields, on Parks Branch in Knott County, started with 622,000 cu. ft. of gas daily, total depth 2,956 feet, in shale.

Shewey, Hale & Ware No. 1 Nan Stepp (Stepp heirs No. 2) land, on Davis Branch in Martin County, total depth 2,530 feet, in shale, produced 283,000 cu. ft. of gas the first day.

McIntosh and others deepened No. 1, May Layne land, on Toms Creek in Floyd County, to 2,595 feet, in shale, and it increased to 52,000 cu. ft. of gas daily.

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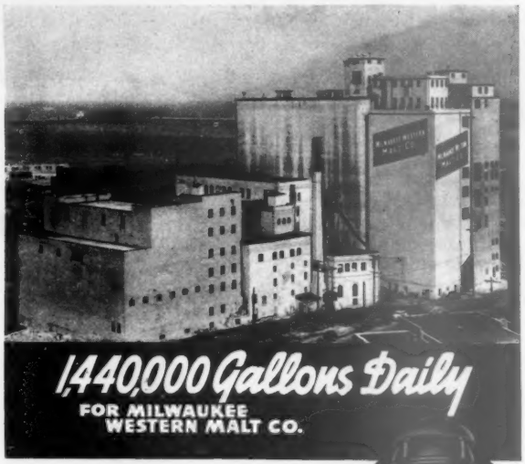

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Canadian Fields

Completions and Operations in Northwest and in Ontario

By VICTOR LAURISTON

CHATHAM, Ont., Mar. 18. — On the Twin Dome structure, some 30 miles northeast of Turner Valley and 22 miles southeast of Calgary, Anglo-Canadian Oil Co. No. 1, LSD 7, Section 16-21-28w4, got the Madison limestone at 6,651 feet and cemented casing in the top of the lime.

The well, which has logged closely with Turner Valley, proves the limestone on a structure of considerable extent apparently running parallel to Turner Valley. Previous tests east of Turner Valley have either, like the Arca Development Corp. test, got the limestone at very great depths or have failed to reach the lime. Anglo-Canadian No. 1 is the first well in this area to get the Madison at depths comparable to those on the Turner Valley west flank. The lime here is, in fact, shallower than in some of the west-flank producers.

The Twin Dome structure is believed to be a broader and more gentle fold than Turner Valley, with prospects of a very large producing area. The test got oil showings in the Dalhousie sand before reaching the lime, though no showings were reported at the lime contact. As soon as cement sets it will be deepened into the lime for a thorough test, following normal Turner Valley drilling practice. Location is about 8 miles east and slightly south of De Winton, and somewhat east and north of the earlier deep tests drilled east of the Turner Valley field. The test was drilled jointly by Anglo-Canadian Oil Co. and Petroleum Investments, Ltd., the former company holding about 35,000 acres on structure.

Tests in the Lime

On the Turner Valley west flank Royalite Oil Co. No. 37, LSD 11, Section 5-19-2w5, in West Central Turner Valley, finished at 7,628 feet with flow of 1,217 bbls. a day through 1-inch choke and gas-oil ratio of 1,133 cu. ft. per barrel. It has been given production quota of 218 bbls. a day.

In South Turner Valley D. & D. Oils No. 1, LSD 12, Section 9-18-2w5, finished in the Madison lime at 7,400 feet, is estimated good for 500 bbls. a day after sceond acidization with 10,000 gallons. Packer has been installed and the lime will be given a further acid treatment before determining the official allowable.

North Turner Valley

In North Turner Valley Royalite Oil Co. No. 35, LSD 7, Section 27-20-3w5, is below 6,672 feet, after getting the Madison lime at 6,173 feet, and drilling in a hard formation about 50 feet deeper than the main porous horizon is usually encountered. The well, south and east of Home No. 2 Millarville, is the only test active in North Turner Valley.

West Central Area

In West Central Turner Valley Davolite Oil Co. No. 1, LSD 10, Section 18-19-2w5, is below 200 feet. In Section 7-19-2w5 Valley Drilling Co. No. 1, LSD 11, is standing at 350 feet. In Section 6-19-2w5 East Crest Oil Co. No. 4, LSD 8, is in a hard formation of the Blairmore below 6,528 feet, with the Home sands expected around 6,900 feet. In Section 5-19-2w5 Calwin Royalties No. 1, LSD 15, is in the lower Benton formation below 4,494 feet and getting close to the Jumping Pound sands. Royalite Oil Co. No. 40, LSD 4, is below 724 feet. Winalta Royalties No. 1, LSD 1, is below 2,966 feet.

West Side Drilling

In Section 32-18-2w5 George Harris and associates No. 2, LSD 15, is below 4,130 feet. Oil Ventures No. 1, LSD 14, is below 4,309 feet after entering the cardium sandstone. Vantage Oils No. 1, LSD 12, has resumed after cementing 16-inch casing at 1,005 feet. British Colonial Oils No. 1, LSD 5, is below 5,400 feet. In Section 29-18-2w5 Royal Canadian Oil Co. No. 3, LSD 12, is below 1,050 feet. Royalite Oil Co. No. 39, LSD 3, is below 2,772 feet. In Section 20-18-2w5 York Oils No. 2, LSD 6, is below 6,076 feet and entering the Blairmore formation. In Section 17-18-2w5 Anglo-Canadian Oil Co. No. 4, LSD 6, is below 3,969 feet. Anglo-Canadian No. 6, LSD 3, is below 1,759 feet. Extension Royalties No. 2, LSD 11, is below 1,923 feet after setting 13⅜-inch casing at 1,698 feet. Royalite Oil Co. No. 41, LSD 1, has location.

In Section 16-18-2w5 Okalta Oil Co. No. 8, LSD 6, is below 3,720 feet and nearing the top of the Benton formation.

In Section 9-18-2w5 George Harris and associates No. 1, LSD 13, is in the Blairmore formation below 6,120 feet and logging slightly deeper than Royal Canadian No. 2 producer to the northeast.

In the far south Theo. Grewer No. 1, LSD 14, Section 5-18-2w5, bottoming at 350 feet, is running 15½-inch casing to 329 feet before deepening.

West of the main producing area Anglo-Canadian Oil Co. No. 5, LSD 8, Section 31-18-2w5, is below 5,550 feet. Scottish Petroleums No. 1, LSD 16, Section 19-18-2w5, is below 6,130 feet. Royalite Oil Co. No. 38, LSD 16, Section 8-18-2w5, is in the Blairmore formation below 6,664 feet.

Alberta Drilling Prospects

An early estimate indicates a likelihood that expenditures on Alberta drilling, chiefly in Turner Valley, during the current year will aggregate around $11,500,000. This includes two wells still testing, 24 actively drilling and six standing at various depths but expected to resume, in Turner Valley. The Royalite Oil Co. drilling program for the same field contemplates 10 to 12 wells, of which, however, several are already under way; and Brown Oil Corp. is planning to drill three wells. Standard Oil Co. of California is scheduled to

(Continued on Page 145)

WILDCAT OPERATIONS

CALIFORNIA

IMPORTANT WELLS AND NORTHERN CALIFORNIA WILDCATS

Company, well, location, and county—	S. T. R.	Depth	Status—
Moore, E. H., No. 11 Sugar, Santa Maria Valley, S.B.	19-10-34	4,607	sd. sh. drlg.
Moore, E. H., No. 12 Sugar, Santa Maria Valley, S.B.	19-10-34	4,670	sd. sh. drlg.
Getty, G. F., No. 8 Vicente, Santa Maria Valley, S.B.	27-10-34	4,890	sd. sh. drlg.
Gerard & Thompson, No. 1-B, S. Maria Valley, S.B.	27-10-34	4,180	sd. sh. drlg.
Richfield Oil, No. 1 Tinaquaic, Foxen Can., S. B.	36- 9-32	4,726	sd. sh. drlg.
Barnsdall Oil, No. 5 Magenheimer, Gato Ridge, S. B.	9- 8-32	4,385	rig to pump
General Pet., No. 1 Chamberlin, Los Olivos, S. B.	12- 7-31	2,970	sd. sh. drlg.
United West. Oil, No. 1 Los Olivos, Santa Barbara	16- 7-30	3,552	hd. sd. drlg.
Litho Oil, No. 1 R. I. E., Capitan, Santa Barbara	5- 4-30	1,283	sd. sh. drlg.
West. Oil Roy., No. 1 Bryce, Carpinteria, Santa B.	29- 4-25	2,062	sd. sh. drlg.
Garvin & Seaman, No. 1 Gauthier, Summerland, S.B.	22- 4-26	1,496	reaming
Oil Group, Inc., No. 1 Hyland, Summerland, S. B.	16- 4-26	341	sd. sh. drlg.
Merchants Pet., No. 8 Hillside, Sespe, Ventura	1- 4-20	1,737	sd. sh. drlg.
Ivers, H. A., No. 14 Kentuck, Sespe, Ventura	1- 4-20	1,140	sd. sh. drlg.
Section 20 Oil, No. 21, Sespe, Ventura	20- 5-19	2,540	cmtd. 2,537
Shomy Oil, No. 1 Hill, Bardsdale, Ventura	32- 4-19	170	sd. sh. drlg.
Continental Oil, No. 10 Grubb, San Miguelito, Vent.	24- 3-24	7,035	sd. sh. drlg.
C. C. M. Oil, No. 25-B Hobson, Rincon, Ventura	17- 3-24	3,295	gr. sd. drlg.
Rincon Dev., No. 82-4 State Permit, Rincon, Ventura	7- 3-24	4,150	redrlg. 1,660
Tide Water A. O., No. 40 V.L.W., Vent. Ave., Vent	25- 3-23	8,580	sd. sh. drlg.
Tide Water A. O., No. 14 McGonigle, Vent. Ave., Vent.	23- 3-23	6,070	sd. sh. drlg.
Tide Water A. O., No. 77 Lloyd, Vent. Ave., Vent.	27- 3-23	7,732	sd. sh. drlg.
Tide Water A. O., No. 123 Lloyd, Vent. Ave., Vent.	27- 3-23	6,471	sd. sh. drlg.
Tide Water A. O., No. 124 Lloyd, Vent. Ave., Vent.	23- 3-23	3,662	sd. sh. drlg.
Tide Water A. O., No. 134 Lloyd, Vent. Ave., Vent.	27- 3-23	8,339	recmtd. 8,050
Tide Water A. O., No. 8 Hartman, Vent. Ave., Vent.	22- 3-23	6,040	sd. sh. drlg.
Shell Oil, No. 98 Taylor, Ventura Ave., Ventura	21- 3-23	5,326	fish D.P.
Shell Oil, No. 33 Edison, Ventura Ave., Ventura	28- 3-23	5,129	redrlg. 5,110
Brit. Amer. Oil, No. 7 Bolsa, Vent. Ave., Vent.	22- 3-23	7,498	sd. sh. drlg.
Alliance Pet., No. 3 Hisey, Ventura Ave., Ventura	21- 3-23	6,080	sd. sh. drlg.
Lloyd Corp., No. 2 Dabney, Ventura Ave., Ventura	23- 3-23	8,498	sd. sh. drlg.
Cal. Exp., No. 2 Occidental, Lost Hills, Kern	24-26-20	5,612	coring ahead
Belridge Oil, No. 35-26-A, North Belridge, Kern	35-27-20	8,750	flow 280 b.d.
Belridge Oil, No. 26-25, North Belridge, Kern	26-27-20	8,500	flow 315 b.d.
Belridge Oil, No. 26-39, North Belridge, Kern	26-27-20	6,086	br. sh. drlg.
Tide Water A. O., No. 23-3, North Belridge, Kern	22-27-20	7,225	hd. sd. drlg.
Richfield Oil, No. 3 Belridge, North Belridge, Kern	22-27-20	7,596	br. sh. drlg.
Amerada Pet., No. 6 Beer, Blackwells Cor., Kern	21-26-19	4,590	sd. sh. drlg.
Herzog, R. D., No. 1 Den, Devil's Den, Kern	27-25-18	620	idle
Standard Oil, No. 1 M. & L., Delano gas field, Kern	3-25-23	2,462	sd. sh. drlg.
Dilamar Oil, No. 3 Quinn, Jasmin, Kern	15-25-27	1,748	sd. sh. drlg.
Crestmont Oil, No. 1 Coffee, Round Mountain, Kern	8-28-29	1,470	sd. sh. drlg.
Trico O. & G., No. 1 Olcese, Round Mountain, Kern	17-28-29	1,698	sd. sh. drlg.
C. C. M. Oil., No. 1-31 Kern, Coffee Canyon, Kern	31-27-29	790	sd. sh. drlg.
Combs Bros., No. 1 Kern, Kern River, Kern	28-28-28	520	sd. sh. drlg.
D. B. K. Co., No. 2 Kern, Kern River, Kern	34-28-28	184	sd. sh. drlg.
Italo Pet., No. 1 Judkins, Kern River, Kern	19-28-28	165	sd. sh. drlg.
Triad Oil, No. 1 A.H.S., Kern River, Kern	19-28-28	1,199	bailing
Shell Oil, No. 1 Glide, West Mount Poso, Kern	29-27-28	2,504	redrlg. 2,394
O'Reily, F., No. 1 Berree, Edison, Kern	5-30-29	4,156	flow 75 b.d.
Oils, Inc., No. 1 Cauley, Edison, Kern	16-30-29	4,197	cleaning out
Superior Oil, No. 1 Jewett, Arvin, Kern	16-31-29	1,998	sd. sh. drlg.
Texas Co., No. 35-1, KCL, Fruitvale, Kern	35-28-26	8,291	sd. sh. drlg.
Western Gulf Oil, No. 1, KCL, Fruitvale, Kern	14-28-27	2,797	sd. sh. drlg.
Pacific Southwest Oil, No. 1 Dilion, Fruitvale, Kern	27-29-27	3,697	poor O.S.
Continental Oil, No. 4-A, KCL, Wasco, Kern	8-27-24	13,153	flow 7,500 b.d.
Standard Oil, No. 2 Mushrush, Wasco, Kern	7-27-24	12,982	hd. sh. drlg.
Standard Oil, No. 8-2-B, KCL, Wasco, Kern	17-27-24	10,990	hd. sh. drlg.
Union Oil, No. 36-1, KCL, Shafter, Kern	36-27-24	7,570	sd. sh. drlg.
Cal. Expl., No. 1 Dougherty-Salisbury, Butt'nw., Kern	7-29-24	11,640	tight O.S.
General Pet., No. 3 Van Ness, Rio Bravo, Kern	2-29-25	11,480	flow 1,915 b.d.
General Pet., No. 1 Caldwell, Rio Bravo, Kern	35-28-25	10,497	sd. sh. drlg.
Superior Oil, No. 1 Moodie, Rio Bravo, Kern	26-28-25	2,316	sd. sh. drlg.
Shell Oil, No. 23-2-A, KCL, Rosedale, Kern	2-29-29	8,691	sd. sh. drlg.
Standard Oil, No. 2 Fleishauer, Greeley, Kern	20-29-26	11,900	P.B. 11,575
Standard Oil, No. 11-16, KCL, Greeley, Kern	20-29-26	10,550	hd. sd. drlg.
Standard Oil, No. 11-17, KCL, Greeley, Kern	18-29-26	9,850	br. sh. drlg.
Standard Oil, No. 12-6, KCL, Greeley, Kern	30-29-26	9,050	hd. sh. drlg.
Standard Oil, No. 1 Elrich, Greeley, Kern	20-29-26	12,900	br. sh. drlg.
Superior Oil, No. 12, KCL, Greeley, Kern	3-30-26	13,150	gr. sd. drlg.
Shell Oil, No. 81-25-A, KCL, Ten Section, Kern	25-30-25	7,860	sd. sh. drlg.
Shell Oil, No. 23-14-A, KCL, Canal, Kern	14-30-25	8,190	sd. sh. drlg.
Shell Oil, No. 87-4-B, KCL, Canal, Kern	4-30-25	12,596	sd. sh. drlg.
Ohio Oil, No. 11-E, KCL, Canal, Kern	14-30-25	3,970	sd. sh. drlg.
Richfield Oil, No. 52-32-A, KCL, Tupman, Kern	32-30-25	8,297	br. sh. drlg.
Union Oil, No. 1-11, KCL, Coles Levee, Kern	11-31-25	9,685	sd. sh. drlg.
Standard Oil, No. 20-1, KCL, Coles Levee, Kern	9-31-25	8,390	sd. sh. drlg.
Ohio Oil, No. 2-F, KCL, Coles Levee, Kern	10-31-25	9,653	O.S. drlg.
Premier-Padran Oil, No. 1 Sunset, Midw.-Sunset, Kern	25-32-23	1,737	sd. sh. drlg.
Honolulu Oil, No. 5-A Vista, Midway-Sunset, Kern	14-32-24	3,024	pump 10 b.d.
Hoyt, Otis, No. 10 Sunset, Midway-Sunset, Kern	7-11-23	3,078	pump 106 b.d.
Fried, Julius, No. 1 Fried, Midway-Sunset, Kern	34-32-24	5,035	recmtd. 4,400
National Oil, No. 32 Midway, Midway-Sunset, Kern	35-32-23	1,950	br. sh. drlg.
Texas Co., No. 33 Sunset, Midway-Sunset, Kern	32-32-24	3,183	cleaning out
Standard Oil, No. 7-29 Western, McKittrick, Kern	7-30-22	2,347	tested wet
Gates, F. E., No. 2 Laymance, McKittrick, Kern	20-30-22	360	sd. sh. drlg.
Westco Pet., No. 1 West, McKittrick, Kern	34-30-22	6,403	sd. sh. drlg.
Tide Water A. O., No. 2 S.P., Tejon Ranch, Kern	15-11-19	7,326	P.B. 6,962
Petrol Corp., No. 33-5 Reserve, Tejon Ranch, Kern	33-11-19	8,930	gr. sd. drlg.
Progressive Oil, No. 3, E. Coalinga, Fresno	20-19-15	868	sd. sh. drlg.
Foreign Oil, No. 6 Annex, W. Coalinga, Fresno	6-21-15	2,488	cmtd. 2,405
Kolinga Refining, No. 2 Hill, W. Coalinga, Fresno	14-20-14	1,090	sd. sh. drlg.
Tyler & Cornwell, No. 4 Tyler, W. Coalinga, Fresno	14-20-14	270	sd. sh. drlg.
Ramsey, W. E., No. 2 Fearon, W. Coalinga, Fresno	18-20-15	4,835	will deepen
Jarvis, L. F., No. 2 Leo, W. Coalinga, Fresno	14-20-14	812	idle
Amerada Pet., No. 7-17 S.P.L., N. Coalinga, Fresno	17-19-16	7,140	br. sh. drlg.
Petseahon, No. 31-7-F, S.E. Coalinga, Fresno	7-20-16	5,528	cmtd. 687
Petseahon, No. 35-7-F, S.E. Coalinga, Fresno	7-20-16	7,053	O.S. drlg.
Petseahon, No. 22-18-F, S.E. Coalinga, Fresno	18-20-16	6,970	br. sh. drlg.
Texas Co., No. 1 fee, S.E. Coalinga, Fresno	6-20-16	5,973	fish D.P.
Standard Oil, No. 71-13-C fee, S.E. Coalinga, Fresno	13-20-15	6,398	br. sh. drlg.
Standard Oil, No. 73-13-C fee, S.E. Coalinga, Fresno	13-20-15	5,380	sd. sh. drlg.
Superior Oil, No. 3 fee, S.E. Coalinga, Fresno	7-20-16	7,630	br. sh. drlg.
Superior Oil, No. 4 fee, S.E. Coalinga, Fresno	7-20-16	7,478	br. sh. drlg.
K. N. D. A., No. 54-24-H, Kettleman North, Fresno	24-21-16	10,010	sd. sh. drlg.
K. N. D. A., No. 47-16-Q, Kettleman North, Kings	16-22-18	6,770	br. sh. drlg.
K. N. D. A., No. 36-18-Q, Kettleman North, Kings	18-22-18	7,610	br. sh. drlg.
K. N. D. A., No. 6-22-Q, Kettleman North, Kings	22-22-18	5,190	sd. sh. drlg.
K. N. D. A., No. 78-22-Q, Kettleman North, Kings	22-22-18	7,960	cleaning out
Standard Oil, No. 56-1-P, Kettleman North, Kings	1-22-17	8,282	gr. sd. drlg.
Standard Oil, No. 61-11-P, Kettleman North, Kings	11-22-17	6,284	will deepen
Standard Oil, No. 76-7-Q, Kettleman North, Kings	7-22-18	7,590	hd. sd. drlg.
Standard Oil, No. 74-17-Q, Kettleman North, Kings	17-22-18	5,678	br. sh. drlg.
Standard Oil, No. 81-19-Q, Kettleman North, Kings	19-22-18	5,970	sd. sh. drlg.
Standard Oil, No. 41-21-Q, Kettleman North, Kings	21-22-18	4,893	sd. sh. drlg.
Standard Oil, No. 83-21-Q, Kettleman North, Kings	21-22-18	5,581	sd. sh. drlg.
Cal. Pet. Prod., No. 1 Irons, Cuyama, S. L. Obispo	19-10-24	1,830	redrlg. 1,798
Newton, S. M., No. 1 Stafford, Panorama, S. L. Obispo	18-31-21	998	cleaning out
Epco, Inc., No. 1 Ajax, Union, San Luis Obispo	27-26-13	4,674	br. sh. drlg.
Texas Co., No. 1 Arroyo Seco, Greenfield, Monterey	11-19- 5	1,860	sd. sh. drlg.

IMPORTANT WELLS AND SOUTHERN CALIFORNIA WILDCATS

Company, well, location, and county—	S. T. R.	Depth	Status—
Texas Co., No. 1 Anderson, Ocean Park, Los Angeles	17- 2-15	7,336	tested dry
A. B. C. Oil, No. 1 Angelich, Torrance, Los Angeles	23- 4-14	5,155	O.S. drlg.
Alford Oil, No. 14 Lomita, Torrance, Los Angeles	23- 4-14	5,150	O.S. drlg.
Century Oil, No. 1 Smith, Torrance, Los Angeles	23- 4-14	3,990	sd. sh. drlg.
Cinco Oil, No. 1 Woodruff, Torrance, Los Angeles	23- 4-14	3,600	cleaning out
Cuba Oil, No. 2 Conrell, Torrance, Los Angeles	23- 4-14	5,175	O.S. drlg.
Campeet Oil, No. 17-A Kleinmyer, Torrance, L. A.	23- 4-14	5,120	sd. sh. drlg.
Critton & Colvin, No. 1 Clark, Torrance, L. A.	23- 4-14	5,168	cleaning out
Deep Hole Drlg., No. 2 Kovell, Torrance, L. A.	23- 4-14	4,990	sd. sh. drlg.
Elliott, D. W., No. 9 Kettler, Torrance, L. A.	23- 4-14	3,870	redrlg. 1,182
Golden Bear Oil, No. 1 Goemarey, Torrance, L. A.	23- 4-14	4,896	sd. sh. drlg.
Hathaway Oil, No. 1 Myers, Torrance, Los Angeles	23- 4-14	5,160	flow 980 b.d.
Hydrocarbon Prod., No. 1 Duchess, Torrance, L. A.	23- 4-14	4,193	sd. sh. drlg.
Kirk, W. A., No. 9 Lomita, Torrance, Los Angeles	23- 4-14	5,095	pump 90 b.d.
Kildumac Oil, No. 1 Mitchell, Torrance, Los Angeles	23- 4-14	4,697	sd. sh. drlg.

KEY TO ABBREVIATIONS USED IN DRILLING REPORTS

Abd., abandoned.
Acd., acidized.
B.O., barrels of oil.
B.P.D., barrels per day.
B.D., barrels daily.
B.P., back pressure.
B.R., building rig.
B. ck., bottom choke.
Br. sh., brown shale.
B.S., basic sediment.
C.&P., cellar and pits.
Cd. or Crd. cored.
C.D., correct depth.
Cg., coring.
Cmtd., cemented.
C.O., cleaning out.
Comp., completed.
Compr., compressor.
C.P., casing pressure, also cement through perforations.
Csg., casing.
D.D., drilling (or drilled) deeper.
Drlg. or Drg., drilling.
Drk. or Dk., derrick.
D.S., drill stem.
D.S.T., drill stem test.
D.&A., dry and abandoned.
Fsg., fishing.
Gbo., gumbo.
G.I., gas injection.
Gr., gravity.
Gr. sd., gray sand.
Grn. sh., green shale.
Hd. sd., hard sand.
H.F.W., hole full of water.
I.P., initial production.
L., lime.
L.D.D., later drilled deeper.
Lnr., liner.
Loc., location.
M.I.M., moving in material.
M.I.R., moving in rig.
M.I.R.T., moving in rotary tools.
M.O.T., milling on tools.
O.I.H., oil in hole.
O.S., oil sand.
O.T.D., old total depth.
O.W.D.D., owell drilling deeper.
O.W.P.B., old well plugging back.
P.B., plugging back.
P.B.P., pulling or pulled big pipe.
P.L., pipe line.
P.L.O., pipe line oil.
Pmpg., pumping.
P.O.P., putting on pump.
P.P., pulled pipe.
Rd. sd., red sand.
Rd. sh., red shale.
Recmt., recemented.
Recvd., recovered.
Rmg., reaming.
Redrlg., redrilling.
Rng.,) running.
R.O.G., rig on ground.
R.P., rock pressure.
R.U., rigging up.
R.U.R., rigging up rotary.
R.U.S.T., rigging up standard tools.
R.&T., rods and tubing.
S. or Sd., sand.
S.D., shut down.
Sdy. sh., sandy shale.
Sdtrk. or St., sidetracking.
S.D.P.L., shut down for pipe line.
S.D.O., or S.D.W.O., shut down awaiting orders.
S.G., show gas.
Sh.&L., shale and lime.
S.I., shut in.
S.I.P., shut in, prorated.
S.L.M., steel line measurement.
S.O., show oil.
S.O.G.&W., show of oil, gas and water.
Spdg. or Spd., spudding.
S.R., straightreaming.
Stdg., standardizing (also standing)
S.W., salt water.
Swbg., swabbing.
T.A., temporarily abandoned.
Tbg., tubing.
T.D., total depth.
T. ck., top choke.
T.P., tubing pressure.
Tr., tract.
Tstd., tested.
U.R., underreaming.
W.I.H., water in hole.
W.O., workover.
W.O.C., or W.O.C.S., waiting on cement to set.
W.O.O., waiting for orders.
W.P., working pressure.
W.S.O., water shutoff.
W.S.S.O.K., water shutoff O.K.
W.S.R. or W.O.S.R., awaiting standard rig.
Wtr., water.

Lebow-McNee Oil, No. 1-B Kettler, Torrance, L. A.	23-	4-14	3,697	sd. sh. drlg.
Lone Star Drlg., No. 1 Pestor, Torrance, L. A.	23-	4-14	3,589	sd. sh. drlg.
McCaslin, W. E., No. 1 Robertson, Torrance, L. A.	23-	4-14	3,670	sd. sh. drlg.
Pacific West. Oil, No. 7 Marble, Torrance, L. A.	15-	4-14	4,990	redrlg. 4,483
Peters Roy. Corp., No. 1 Bass, Torrance, L. A.	23-	4-14	4,880	fish D.P.
Rilling & Co., No. 1 H. & H., Torrance, L. A.	23-	4-14	4,750	sd. sh. drlg.
Standard Oil, No. 1-11 Marble, Torrance, L. A.	22-	4-14	3,825	rigged up
Sunset Oil, No. 1 La Salle, Torrance, Los Angeles	23-	4-14	5,170	O.S. drlg.
Vesta Pet., No. 1 Bruhn, Torrance, Los Angeles	23-	4-14	5,171	O.S. drlg.
Woolner Oil, No. 7 Lomita, Torrance, Los Angeles	23-	4-14	5,139	O.S. drlg.
Wilson, Ray, No. 3 Lomita, Torrance, Los Angeles	23-	4-14	5,179	sd. sh. drlg.
Whit. S. F. S. Synd., No. 1 Mertz, Torrance, L. A.	23-	4-14	3,871	sd. sh. drlg.
C. C. M. O., No. 41, Torrance, Los Angeles	15-	4-14	4,922	sd. sh. drlg.
C. C. M. O., No. 51, Torrance, Los Angeles	14-	4-14	5,028	pump 60 b.d.
C. C. M. O., No. 12 Kettler, Torrance, Los Angeles	14-	4-14	3,825	rigged up
Texas Co., No. 4 Oakley, Harbor City, L. A.	30-	4-13	4,200	O.S. drlg.
Union Oil, No. 25 Callender, Dominguez, L. A.	33-	3-13	4,795	pump 180 b.d.
Union Oil, No. 66 Callender, Dominguez, L. A.	33-	3-13	6,870	sd. sh. drlg.
Union Oil, No. 11 Carson, Dominguez, L. A.	33-	3-13	5,880	sd. sh. drlg.
Union Oil, No. 49 Hellman, Dominguez, L. A.	33-	3-13	9,474	cleaning out
Shell Oil, No. 97 Reyes, Dominguez, Los Angeles	33-	3-13	10,000	dry; abd.
Barnsdall Oil, No. 12 Rosecrans, Rosecrans, L. A.	20-	3-13	7,670	O.S. drlg.
Metcalfe Oil, No. 1 Bradford, Rosecrans, L. A.	20-	3-13	7,198	sd. sh. drlg.
Union Oil, No. 31 Rosecrans, Rosecrans, L. A.	19-	3-13	6,896	sd. sh. drlg.
Universal Consd., No. 15 Trust, Rosecrans, L. A.	18-	3-13	171	sd. sh. drlg.
Basin Oil, No. 4 Club, Potrero, Los Angeles	34-	2-14	4,788	sd. sh. drlg.
Barnsdall Oil, No. 5 R.S.F., Newhall, Los Angeles	26-	4-17	6,680	O.S. drlg.
Standard Oil, No. 1 Ward, Aliso Canyon, L. A.	27-	3-16	3,490	hd. sh. drlg.
Tide Water A. O., No. 2 Porter, Aliso Canyon, L. A.	27-	3-16	3,771	hd. sh. drlg.
Union Oil, No. 1-27 Orcutt, Aliso Canyon, L. A.	27-	3-16	2,931	sd. sh. drlg.
Mangrum & Page, No. 1 Lintz, Newhall, L. A.	4-	3-15	236	sd. sh. drlg.
General Pet., No. 35 Harbor, Wilmington, L. A.	2-	5-13	2,180	sd. sh. drlg.
General Pet., No. 3 Patten, Wilmington, L. A.	2-	5-13	3,615	pump 45 b.d.
General Pet., No. 2 P.E., Wilmington, L. A.	2-	5-13	2,730	sd. sh. drlg.
Bond Pet., No. 2 Mutual, Wilmington, Los Angeles	35-	4-13	2,925	sd. sh. drlg.
Dunlap Oil, No. 3-D-U.P., Wilmington, Los Angeles	3-	5-13	2,448	sd. sh. drlg.
F. A. Pet., No. 1 Franco, Wilmington, Los Angeles	29-	4-13	3,725	cleaning out
Getty, G. F., Inc., No. 8-W, Wilmington, L. A.	33-	4-13	3,595	redrlg. 2,940
Haines, A., No. 1 Harbor, Wilmington, Los Angeles	35-	4-13	3,047	O.S. drlg.
Richfield Oil, No. 22 P.D., Wilmington, L. A.	2-	5-13	3,000	flow 195 b.d.
Richfield Oil, No. 25 P.D., Wilmington, L. A.	2-	5-13	2,194	sd. sh. drlg.
Royalty Ser., No. 8-A Nelson, Wilmington, L. A.	4-	5-13	5,665	flow 160 b.d.
Sonwell Oil, No. 5 Harbor, Wilmington, L. A.	2-	5-13	4,016	flow 351 b.d.
Signal O. & G., No. 1 Allen, Wilmington, L. A.	2-	5-13	3,250	sd. sh. drlg.
Signal O. & G., No. 1-D, L.B.-U.P., Wilmington, L. A.	3-	5-13	3,880	sd. sh. drlg.
Signal O. & G., No. 2-D, L.B.-U.P., Wilmington, L. A.	3-	5-13	3,751	sd. sh. drlg.
Signal O. & G., No. 2 L.B.-P.D., Wilmington, L. A.	2-	5-13	2,654	sd. sh. drlg.
Union Pacific R. R., No. 101, Wilmington, L. A.	34-	4-13	3,162	O.S. drlg.
Union Pacific R. R., No. 107, Wilmington, L. A.	3-	5-13	3,998	O.S. drlg.
Union Pacific R. R., No. 108, Wilmington, L. A.	4-	5-13	3,086	sd. sh. drlg.
Universal Consd., No. 8 Newport, Wilmington, L.A.	2-	5-13	2,775	sd. sh. drlg.
Vulcan Oil, No. 469-1 Gilmore, Wilmington, L. A.	33-	4-13	5,333	deepening
Westgate Greenland Oil, No. 5-A, Wilmington, L. A.	3-	5-13	3,460	sd. sh. drlg.
Ridge Oil, No. 1 Club, Montebello, Los Angeles	3-	2-12	3,698	sd. sh. drlg.
St. Helens Pet., No. 30 Monterey, Montebello, L. A.	2-	2-12	7,275	O.S. drlg.
St. Helens Pet., No. 2 Eggleston, Montebello, L. A.	2-	2-12	5,710	will deepen
St. Helens Pet., No. 4 Mulholland, Montebello, L. A.	2-	2-12	6,449	O.S. drlg.
Standard Oil, No. 5 Braun, Montebello, L. A.	2-	2-12	6,890	sd. sh. drlg.
Stahdard Oil, No. 2 Kaufman, Montebello, L. A.	2-	2-12	6,960	coring ahead
Standard Oil, No. 2 Harvey, Montebello, L. A.	2-	2-12	6,880	sd. sh. drlg.
Standard Oil, No. 4 Harvey, Montebello, L. A.	2-	2-12	6,673	milling 6,305
Standard Oil, No. 5 Whitehead, Montebello, L. A.	3-	2-12	2,884	sd. sh. drlg.
Union Oil, No. 30 La Merced, Montebello, L. A.	1-	2-12	7,778	O.S. drlg.
Stanley Oil, No. 1 Montebello, Montebello, L. A.	2-	2-12	6,050	sd. sh. drlg.
Texas Co., No. 5 Mulholland, Montebello, L. A.	2-	2-12	6,390	tested wet
Traders Oil, No. 1 Extension, Montebello, L. A.	2-	2-12	2,478	sd. sh. drlg.
Graham & Loftus, No. 1 Coffman, Montebello, L. A.	2-	2-12	4,380	sd. sh. drlg.
Vulcan Oil, No. 1 Calkins, Montebello, L. A.	11-	2-12	3,296	sd. sh. drlg.
Herley-Kelly, Inc., No. 2 Burke, Montebello, L. A.	2-	2-12	7,230	O.S. drlg.
Wood-Callahan Oil, No. 1 Harris, Montebello, L. A.	2-	2-12	4,161	sd. sh. drlg.
Bush Oil, No. 1 Olds, Montebello, Los Angeles	3-	2-12	2,910	fish D.P.
McVicar & Rood, No. 1 Manz, Montebello, L. A.	2-	2-12	7,240	deepening
H. & C. Oil, No. 1 Joyce, Whittier, Los Angeles	22-	2-11	3,598	sd. sh. drlg.
Texas Co., No. 1-13-A Smith, Anaheim, Orange	8-	4-10	8,260	cleaning out
Brea Canyon Oil, No. 49 Brea, Brea Canyon, Orange	2-	3-10	4,891	pump 40 b.d.
Battersby, J. M., No. 1 associates, Carmenita, Orange	21-	3-11	8,992	C.P. 8,965
Standard Oil, No. 68 Emery, W. Coyote, Orange	24-	3-11	3,199	cmtd. 3,118
Southwest Expl., No. 9 State, Hunt. Beach, Orange	4-	6-11	4,375	O.S. drlg.
Southwest Expl., No. 10 State, Hunt. Beach, Orange	4-	6-11	4,130	O.S. drlg.
Dragon Oil, No. 1 Jauman, Hunt. Beach, Orange	36-	5-11	4,625	cleaning out
Texas Co., No. 10 Brown, Huntington Beach, Orange	11-	6-11	3,784	P.B. 3,470
Wilshire Oil, No. 2 H.B., Hunt. Beach, Orange	10-	6-11	5,450	pump 380 b.d.

OKLAHOMA

Week Ending March 18

NORTHERN OKLAHOMA

Atoka County

Giblett No. 1 Rich, SE SE SW Sec. 2-1-12. W.O.C. 704 ft.

Caddo County

Texas Co. No. 1 Smith, C NE NW Sec. 2-5-12w. T.D. 2,556 ft.; S.D.O.

Cleveland County

Harper, Turner et al No. 1 Taylor, SE NE NW Sec. 23-8-2w. Woodford 7,090 ft.; Vla. 7,620 ft.; Simp. 7,680 ft.; dolo. 7,750 ft.; T.D. 8,008 ft.; D.&A.

Nels-Burrton No. 1 Hirsch, NW NW NE Sec. 17-9-2w. O.W.P.B.; O.T.D. 7,692 ft.; T.D. 7,695 ft.; C.O. at 4.500 ft.

Comanche County

Ker-Lyn Oil Co. No. 1 Laging, C NE SW Sec. 30-4-9w. Drlg. 5,483 ft.

Mid Night Oil No. 1 Howe, NW NW NE Sec. 30-2-13w. O.W.D.D.; O.T.D. 703 ft.; T.D. 773 ft.; S.D.

Ed Parsons No. 1 Stephens, C NW SW Sec. 29-4-9w. Drlg. 256 ft.

Garfield County

Hughes Drlg. Co. No. 1 Meisner, C NE NW Sec. 10-20-4w. Vla. 5,705 ft.; 1st Wlx. 5,823-65 ft.; T.D. 5,894 ft.; W.O.C.

Champlin Ref. Co. No. 1 Allen, SE SE SE Sec. 26-24-8w. Vio. 6,962 ft.; dolo. 7,000 ft.; cg. 7,050 ft.

Garvin County

H. R. Hollenbach et al No. 1 Butterly, NE NE SE Sec. 22-1n-1e. 3,218,000 cu. ft. gas; drlg. 3,205 ft.; S.D.; repairs.

Ker-Lyn Oil Co. No. 1 Butterly, NE NE SE Sec. 22-1-1. O.W.D.D.; O.T.D. 3,205 ft.; to D.D.

Pure Oil No. 1 Derdeyn, NE NW SE Sec. 19-3-1. Rec. S.W. at 3,739 ft.

Grady County

Carter Oil Co. et al No. 1 Smith C-58, C SE SW Sec. 26-5-8w. S.S.O. 5,329-58 ft.; S.O. 5,433 ft.; cd. 5,964-76 ft.; rec. sh.; cd. 6,351-76 ft.; rec. hd. sd.; T.D. 6,613 ft.; set 9-in. csg. 6,602 ft.; W. O.C.

Ed Parsons No. 1 McKenney, SE SE SW Sec. 30-3-8w. Drlg. 501 ft.

Hughes County

Skelton et al No. 1 Gilmore, C N½ NE SE Sec. 7-5-9. Drlg. 674 ft.

Jackson County

English & Morgan No. 1 Lee, NW NW SE Sec. 36-2-19w. Drlg. 500 ft.

Kay County

Cooper Drlg. Co. No. 1 Caughlin, SE NE SW Sec. 30-25-1. Drlg. 135 ft.

Crawford No. 1 Boehl, SE SE NW Sec. 34-27-2w. T.D. 1,040 ft.; S.D.

C. C. Nye No. 1 Wolfenbarger, SW NW SW Sec. 16-27-4. T.D. 3,201 ft.; sd.

Kaw Oil Co. No. 1 Wolfenbarger, NW NW SE Sec. 9-27-4. T.D. 60 ft.; S.D.; rprs.

Kingfisher County

K. A. Ellison No. 1 Baker, NE NE SE Sec. 20-19-5w. Drlg. 3,960 ft.

Ace Gutowsky No. 1 Lankford, NE NE SE Sec. 34-17-6w. Oswg. 6,630 ft.; T.D. 7,082 ft.; D.P. stk.

Kiowa County

C. J. Hagerling No. 1 Kimray, SW SW NW Sec. 36-5-18w. Drlg. 680 ft.

Wichita Oil, Inc., No. 1 Mace, SW SW SW Sec. 11-5-15w. S.D. 127 ft.

McIntosh County

Scruggs et al No. 1 Lanning, SE SW SW Sec. 19-12-15. Spd.

Murray County

M. A. Saunders No. 1 Vanderslice, C SW SW Sec. 25-2-2. S.D. 925 ft.; wtr.

Muskogee County

Heydrick No. 1 Paschall, NE SE NW Sec. 22-13-19. S.D. 1,446 ft.

Petroleum No. 1 Scott, SE SW SW Sec. 14-13-19. Mch.

Okfuskee County

Carter & Hight No. 1 Rogers, SW SW SW Sec. 6-13-8. T.D. 2,850 ft.; P.B. 2,498 ft.; P.O.P.

I. T. I. O. No. 1 Palmer, NE SE NW Sec. 5-10-9. Drlg. 1,455 ft.

Oklahoma County

E M. Eldridge No. 1 White, C NE NE Sec. 30-11-1. Drlg. 5,975 ft.

O. A. Walters No. 1 Olmstead, C E½ SE NW Sec. 12-14-3w. W.O.C. 294 ft.

Okmulgee County

Jim Wise Drlg. Co. No. 1 Morrow, SW NW NE Sec. 16-15-13. 3,000,000 cu. ft. gas 1,930-38 ft.; decreased to 1,000,000 cu. ft. at 1,985 ft.; T.D. 1,985 ft.; S.D.

Pawnee County

Ed Kelly No. 1 Hill, SW SW SE Sec. 1-21-5. Drlg. 1,965 ft.

Pittsburg County

Phillips Pet. Co. No. 1 Hubacker, C NW NE Sec. 11-7-15. Drlg. 5,856 ft.

Pontotoc County

Union Dev. Co. No. 1-A Abbott, SW NW NE Sec. 34-3-6. S.D. 4,100 ft.

L. Walker No. 1 King, SW SE NW Sec. 5-4-7. Drlg. 617 ft.

Pottawatomie County

Grimes et al No. 1 Dye, NW NW SE Sec. 2-5-5. Wlx. 3,355 ft.; T.D. 3,379 ft.; to test Hntn. at 2,660 ft.

Johnson & Kimmitz No. 1 Billington, NW NW SE Sec. 8-7-5. Drlg. 3,110 ft.

J. E. Trigg No. 1 Truesdell, SW SW SE Sec. 21-7-5. Drlg. 2,240 ft.

Wood Oil Co. No. 1 Peters, SW SE NW Sec. 28-8-4. Wlx. 3,540 ft.; dolo. 4,365 ft.; p. 40 B.O. and 60 B.W. in 24 hrs.

Sequoyah County

Thompson Brs. No. 1 Ruby, NW NW NE Sec. 30-12-22. T.D. 1,050 ft.; rng. 8-in.

Seminole County

Atlantic Ref. Co. No. 1 Atkinson, NW NW SW Sec. 17-6-6. Misener 3,697 ft.; Viola 3,718 ft.; T.D. 4,023 ft.; P.B. 3,819 ft.; drld. out to 3,839 ft.; pmp. 160 B.F. in 12 hrs.; tstg.

Atlantic Ref. Co. No. 1 Jimmey, SE NW NE Sec. 21-7-6. Loc.

Burke-Greis No. 1 Harjoche, NE NE SW Sec. 19-8-7. Drlg. 3,870 ft.

H. S. Moss No. 1 Leachman, C N½ SE NE Sec. 34-10-6. Woodford 4,252 ft.; Hntn. 4,303 ft.; T.D. 4,630 ft.; F. 1,561 B.O. in 18 hrs.

W. C. Wood No. 1 Aldridge, SW NW NE Sec. 5-8-8. T.D. 1,910 ft.; H.F.W.; S. D.O.

Stephens County

Phillips Pet. Co. No. 1 Culbertson, NW NW SE Sec. 4-1-5w. T.D. 5,393 ft.; cd. and rec. sd. and S.S.O.

Texas County

Republic Nat. Gas Co. No. 1 Dulabohn, C Sec. 21-6n-15ecm. Drlg. 2,365 ft.

Republic Nat. Gas Co. No. 1 Judd, CSL SW Sec. 24-6n-15ecm. T.D. 2,870 ft.; gas 7,100,000 cu. ft.

Washita County

Continental Oil Co. No. 1 Proctor, C NW Sec. 28-10-20w. Drlg. 10,357 ft.

L. B. McWhirter No. 1 fee, NW SW SW Sec. 34-8-19w. T.D. 2,190 ft.; S.D.

SOUTHERN OKLAHOMA

Carter County

Pure Oil Co. No. 1 Noble, NE SE Sec. 35-3s-1e. Woodford 4,289 ft.; Hunton 4,638 ft.; Vla. 5,014 ft.; drlg. Simp. 6,103 ft.

Choctaw County

Clyde Ross et al No. 1 Hardy, SE SE NW Sec. 21-7s-15. S.D. 1,406 ft.

Cotton County

Henry Groce No. 6 Collins, NW NW NE Sec. 18-4s-10w. S.S.O. and H.F.W. at T.D. 1,288 ft.; abd.

Jefferson County

H. W. Weir No. 1 Carmichael, NE NE SW Sec. 23-7s-7w. W.O.C. 102 ft.

Marshall County

Hughes et al No. 1 Vittitto, C NE SE Sec. 11-5s-4e. O.W.D.D.; O.T.D. 7,100 ft.; S.D.O.

Murray County

A. G. Carter No. 1 Vensonite, 1,170 ft. W and 150 ft. S, Sec. 34-1s-2e. S.S.O.; drlg. 1,522 ft.

Tillman County

Smith No. 2 Hammel, NE NW NW Sec. 6-5s-15w. T.D. 2,420 ft.; C.O. 2,100 ft.

KANSAS

Week Ending March 18 (Descriptions are East unless marked otherwise)

Barber County

Barbara Oil Co. No. 1 Wilson, C SE Sec. 17-33-13. K.C. 4,097 ft.; Vla. 4,950 ft.; R.U.S.T. 5,160 ft.

Olson Oil Co. No. 1 Coffman, C NW NE Sec. 25-31-12w. Vla. 4,512 ft.; Simp. 4,600 ft.; Arb. 4,800-50 ft., T.D.

Barton County

Central Pet. and Vernon O. & G. No. 1 Miller, SE SW SE Sec. 17-16-13w. Tpk. 2,875 ft.; C.O.

Gulf Oil Corp. No. 1 Dolecheck, CNL NE SW Sec. 24-16-12w. W.O.C. 340 ft.

Gulf Oil No. 1 Louis, C N½ NW SW Sec. 2-20-12w. Arb. 3,347 ft.; S.S.O. 3,373 ft.; T.D. 3,375 ft.; 200 ft. O.I.H.

Long & Johnson No. 1 Eveleigh, SW SW NE Sec. 8-16-12w. T.D. 2,900 ft.; F. 20 B. O.P.H.; killed gas.

I. W. Murfin No. 1 Birzer, NE SW Sec. 21-19-11w. Pay 3,130 ft. and 3,152-54 ft.; 1,200 ft. O.I.H. in 8 hrs.

York State Oil Co. No. 1 Marchand, CEL NE NE Sec. 24-20-12w. W.O.C. 215 ft.

Butler County

Bowland & McCoy No. 1 Frankson, SE SW Sec. 2-29-6. S.D. 165 ft.

Hay, Hall & Table-Mesa Oil Co. No. 1 Ferrell, SW NW NE Sec. 28-28-8. Top pay 2,685 ft.; T.D. 2,689 ft.; 450 ft. O.I.H.

Cowley County

Lloyd, Frost & Study No. 1 Jones, CEL W½ E½ Sec. 2-31-3. Drlg. 1,186 ft.

Ben Gralapp et al No. 1-A Clark, NW NW NE Sec. 11-31-3e. T.D. 3,248 ft.; P.B. 3,000 ft.

Mead Bros. No. 1 Julian, NE SE NW Sec. 16-33-3. Pay 3,226-36 ft., T.D.; S.D. Phillips Pet. Co. No. 1 Bernard, SE SE NE Sec. 19-33-6. Drlg. 3,436 ft.

Dickinson County

Franks et al No. 1 Huffman, NW NW SW Sec. 11-13-1. Drlg. 2,155 ft.

Ellis County

Darby Pet. No. 1 Peavey, NW NW NE Sec. 24-11-18w. T.D. 3,456 ft.; swb. 110 B.O. in 15 hrs.

Graham County

Continental Oil Co. No. 1 Drumm Comm. Co., SE SE NE Sec. 16-9-21w. Lans. 3,390 ft.; Arb. 3,679-94 ft.; T.D. 3,702 ft.; pmp. 149 B.O. in 8½ hrs.; to acdz.

Continental Oil Co. No. 1 Putnam Inv. Co., CWL SW Sec. 23-9-21w. Set 8-in. 1,518 ft.; drlg. 3,265 ft.

Leavenworth County

John Hardaway No. 1 Scheller, SW SE SW Sec. 30-10-22. S.D. 345 ft.

McPherson County

Marylyn Oil No. 1 Dixon, NW NE NW Sec. 7-19-2w. T.D. 3,018 ft.; acd.; P.& F. 36 B.O. in 24 hrs.

Phillips Pet. Co. No. 1 Esau, CEL W½ NE Sec. 7-21-4w. Misener 3,822 ft.; Simp. 3,925 ft.; drlg. 3,963 ft.

Sinclair Prairie No. 1 Martins, CWL SW Sec. 20-21-3w. Drlg. 3,470 ft.

Marion County

Johnson et al No. 1-A Miltz, SW SW SW Sec. 24-17-4. T.D. 2,485 ft.; S.O. 2,362 ft. and 2,390 ft.; C.O.

Mead County

Pacific Midwest Oil No. 1 Rexford, NE SE SW Sec. 8-30-29w. S.D. 1,435 ft.

Osage County

J. M. Edwards No. 1 Detrick (O.W.D.D.),

C NW SE Sec. 21-14-15. O.T.D. 1,200 ft.; S.D. 1,200 ft.

Ottawa County

Babcock Oil No. 1 Copeman, NW NW Sec. 18-10-2w. Miss. 2,835 ft.; H.F.W. 3,302-10 ft.; S.D. for csg. 3,460 ft.

Pratt County

Champlin Ref. Co. No. 1 Elliott, SW NE Sec. 26-27-14w. Fsg. 4,857 ft.

Rice County

McPherson Drlg. Co. No. 1 Cramm, SE SE SW Sec. 15-19-9w. Drlg.

Spurrier & Bruce No. 1 Cary, NE NW NW Sec. 30-18-8w. O.W.D.D.; O.T.D. 1,530 ft.; S.D. 1,680 ft.

Rooks County

Broadview Oil No. 1 Beardsmore, NW SE SW Sec. 2-9-16w. Drlg. 535 ft.

Phillips Pet. Co. No. 1 Tanzey, C NW SW Sec. 25-8-18w. Arb. 3,418-3,423 ft.; T.D. 3,424 ft.; acd. and swb. 21 B.F.

Russell County

Central Pet. No. 1 Karst, SE NW NE Sec. 21-15-13w. Drlg. 2,665 ft.

Phil-Han No. 1 Weimeister, SW Sec. 13-14-13w. Top pay 2,655 ft.; perf. and acd. and swb. ½ B.O.P.H.; to P.B.

Skelly Oil Co. No. 1 Carter, CSL SW NE Sec. 33-14-13w. 1st pay 2,847 ft.; 2nd pay 2,861 ft.; rng. csg.

Saline County

Central States Oil Co. No. 1 Crawford, NW SW NE Sec. 26-13-3w. Drlg. 1,100 ft.

Sedgwick County

Century Pet. Co. No. 1 Wilke, SW SE SW Sec. 1-29-2. S.D. 800 ft.

Shawnee County

W. M. McKnab No. 1 Fritz, SW SE NW Sec. 4-12-14. Set csg. 2,100 ft.

Stafford County

Continental Oil No. 1 Russell, SW SW NE Sec. 13-25-13w. Arb. 4,024 ft.; pmp. 947 B.O. in 8 hrs.; pot. 2,843 bbls.; comp.

Stanolind O. & G. Co. No. 1 Curtis, SE cor. Sec. 31-21-12w. Viola 3,544 ft.; Arb. 3,638 ft.; R.U.S.T. 3,640 ft.

Virginia Drlg. Co. No. 1 Schlockter-meyer, SE NW Sec. 7-21-11w. Arb. 3,469 ft., T.D.; P. 5 B.O.P.H.

Wabaunsee County

Scheu & Tague et al No. 1 Ave, NW SW NW Sec. 10-12-8. S.D. 605 ft.

Woodson County

Roby et al No. 1 Meairs, SW SW NW Sec. 21-25-14. S.D. 400 ft.

M. J. Trott No. 1 Abbott, NW NE NE Sec. 21-25-14e. Drlg. 1,325 ft.

LOUISIANA

N. LOUISIANA WILDCATS

Bienville Parish

Ark. La. Gas Co. No. 2 Gayoso, 660 ft. SW cor. SE Sec. 14-16-10. T. Tr. Pk. 5,432 ft.; D.S.T. 5,796-5,805 ft. tstd. dry in 26 min.; set 8⅝-in. csg. 6,300 ft.; drlg. sh.&sd. 6,768 ft.

Bossier Parish

Triangle Drlg. Co. No. 1 Sandridge, C SE SW Sec. 14-17-12. Semiporous L. 3,203-12 ft.; set 7-in. csg. 3,200 ft.; T.D. 3,220 ft.; W.O.C.

Caddo Parish

J. P. Adams et al No. 1 Stallcup, N ½ NW NW Sec. 34-22-16. 5½-in. csg. 2,460 ft.; T.D. 2,468 ft.; drlg. plug.

R. E. Allison No. 1 Harman, SW cor. Sec. 34-18-14. Drlg. sh.&bldrs. 2,575 ft.

R. E. Allison No. 1 La. Real Estate Dev. Co., Sec. 4-17-14. Drlg. sh.&L. 3,050 ft.

Ark. La. Gas Co. No. 1 Leonard fee, NW cor. SW SW Sec. 25-21-16. Set 10-in. 101 ft.

Beckett & Key No. 1 M. C. Stallcup, SE cor. NE NW Sec. 34-22-16. Set 10-in. 103 ft.; T.D. 2,500 ft.; D.&A.

Mose Browning and E. D. Holcomb, Jr., No. 1 Henderson, SW cor. Sec. 27-22-16. Oil sd. 2,495-2,504 ft.; 7-in. csg. 2,489 ft.; set 2 jts. 5½-in. perf. lnr. and 2-in. tbg. with pkr. at 2,467 ft.; set 158 ft. 5½-in. csg. on bttm.; T.D. 2,504 ft. perf. 2,494-2,500 ft.; W.O.S.R.

J. M. Buckler No. 2 Stiles, NE cor. Sec. 17-21-16. 6-in. csg. 1,048 ft.; T.D. 1,051 ft.; tstd. S.W.; W.O.

F. W. Burford No. 3 Brown, NE cor. Sec. 5-23-15. Drlg. sh.&L. 5,433 ft.

Burnham Drlg. Co. No. 1 Bell, SW cor. NW Sec. 34-22-16. D.S.T. 2,435-55 ft.; tstd. 150 ft. oil and 30 ft. mud in 15 min.; set 5½-in. csg. 2,450 ft.; comp.; flwg. by heads est. 50 B.P.D.; T.D. 2,455 ft.

Carney et al No. 3 Hart, SE NW Sec. 21-21-16. Set 8-in. csg. 1,563 ft.; tstd. S.O.; acdzd. with 3,000 gal.; tstd. drv; drld. to 1,930 ft.; tstd. S.W. and will P.B.

Paul Cooper et al No. 2 Stiles, NE cor. SW Sec. 28-21-16. Set 4-in. csg. 2,358 ft.; W.O.C.

J. P. Driscoll et al No. 1 Woolworth, SE cor. Sec. 26-20-15. Set 9⅝-in. csg. 1,370 ft.; T.D. 1,400 ft.; W.O.C.

Leon Dunn No. 1 Nelson, NE cor. Sec. 26-18-14. 9⅝-in. csg. 1,500 ft.; drlg. L. &sh. 2,957 ft.

W. C. Feazel No. 1 Hunter, SW cor. Sec. 23-18-14. Set 9⅝-in. csg. 1,484 ft.; drlg. sh.&anhy. 3,872 ft.

M. M. Ferrell No. 1 Satterwhite, SE NW Sec. 10-20-16. Drlg. 250 ft.

Harry Fotiades No. 1 Tomlinson, C NE NW Sec. 35-18-14. Set 10¾-in. csg. 1,500 ft.; T. sat. 5,574-93 ft.; 5½-in. csg. 5,575 ft.; T.D. 5,595 ft.; wshg. in.

Gerhig Co. No. 1 Land, NW SE Sec. 36-21-16. 5½-in. csg. 2,266 ft.; T.D. 2,278 ft.; W.O.C.

Ralph Gilster No. 1 DeSoto Corp., NW cor. Sec. 26-18-14. Set csg. 1,520 ft.; W.O.C.

H. C. Prod. Co. No. 1 Kinnebrew & Ratcliff, NE cor. Sec. 5-19-16. D.S.T. 2,253 ft.; S.W.; 7-in. csg. 1,497 ft.; P.B. 1,680 ft.; O.T.D. 2,253 ft.; acdzd. with 2,000 gal.; O.&S.W. in hole; tstg. 1,680 ft.

Harry Hanbury No. 1 Slack et al NW cor. Sec. 26-18-14. Drlg. sh.&anhy. 4,173 ft.

A. R. Hancock No. 4 Helpman, Sec. 16-21-16. Set 7-in. csg. 998 ft.; comp.; pmpg. 12 B.P.D.; T.D. 1,017 ft.

A. R. Hancock No. 6 Helpman, NW SE Sec. 16-21-16. Set 6⅝-in. csg. 996 ft.; comp.; pmpg. 13 B.P.D.; T.D. 1,018 ft.

Hill, Neighbors and Rowe No. 1 Thigpen, NW SE Sec. 36-21-16. R.U.

Hurricane Pet. Corp. No. 1-C Chandler, C SW SE Sec. 34-18-14. Jnkd. at 1,256 ft.; skd. over and began second hole; D.S.T. 5,616-25 ft.; tstd. 9 stands mud cut with oil in 7 min.; T. sat. L. 5,617 ft.; set 5½-in. csg. 5,116 ft.; comp.; 550 B.P.D.; ¼-in. ck.; T.P. 1,060 lbs.; C.P. 1,175 lbs.; T.D. 5,625 ft.

Hurricane Pet. Corp. No. 1 Harman, 660 ft. N and W. C Sec. 34-18-14. Set 9⅝-in. csg. 2,010 ft.

C. M. Jones No. 1 Henderson, SW cor. Sec. 27-22-16. Sdy. sh. 2,496-99 ft.; S. S.O.; D.&A.; T.D. 2,530 ft.; S.W.

Wm. C. Leisk No. 1 Sinclair, NW SE Sec. 26-18-14. 13⅜-in. csg. 294 ft.; sat. L. 5,552-58 ft. and 5,560-63 ft.; set 5½-in. csg. 5,554 ft.; T.D. 5,567 ft.; flwd. 33 B.F.P.H., 35% S.W.; ¾-in. ck.; T.P. 500 lbs.; C.P. 100 lbs.; S.I. and opened showing oil and S.W.

Ben Levy No. 1 Crystal fee, SW cor. Sec. 25-21-16. Set 4-in. csg. 2,250 ft.

Lyons et al No. 1 McFaddin, NW cor. Sec. 3-17-14. R.U.

C. D. Loe No. 1 Meyer, SE cor. Sec. 33-18-14. T. Pettit 5,592 ft.; O.T.D. 5,631 ft.; swbd. O.&S.W.; resqzd. all perf. and set plug 5,605 ft.; tstd. dry; reperf. 5,592-5,602 ft. and ripped csg. 5,592-5,602 ft.; reacd. with 500 gal. and tstd. S.O.&S.W.; P.B. 5,200 ft.; jnkd. and abd.; O.T.D. 5,631 ft.

Oblinger & Ritter No. 1 Boisseau, SE cor. Sec. 34-21-16. Set 5-in. csg. 965 ft.

S. H. Riggs and C. C. Gilger No. 1 W. D. Browning, NW cor. NE SW Sec. 27-22-16. R.U. and S.D.

Tippett Drlg. Co. No. 1 Stallcup, NW cor. Sec. 34-22-16. Drlg. sh.&ch. rk. 1,745 ft.

R. W. Williams No. 1 Burton, SE cor. SW Sec. 36-21-16. Set 5½-in. csg. 2,247 ft.; T.D. 2,268 ft.; W.O.S.R.

Caldwell Parish

Critchett & Woods (formerly E. T. Oakes) No. 1 Kyles, NE cor. SW NE Sec. 18-11-3e. S.D. 1,400 ft.

Claiborne Parish

E. T. Oakes et al No. 2 Kilgore, C NW SE Sec. 28-21-5. Hd. to slightly por. L. 5,294-5,303 ft.; 5½-in. csg. 5,287 ft.; acdzd. with 5,000 gal.; swbg.; 2,000 ft. O.I.H. 5,324 ft.; W.O.S.R.

De Soto Parish

S. S. Alexander No. 1-A Stoll, Sec. 5-12-16. Set 7-in. csg. 2,705 ft.; acd. with 3,000 gal. and tstd. est. 2,000,000 cu.ft. gas; 400 lbs.; D.S.T. 2,984-3,046 ft.; tstg 165 ft. mud cut with oil, 35 min.; set short string 5-in. csg. on bttm.; T.D. 3,145 ft.; perf. 3,000-44 ft.; 2,500 ft.; flwd. 3 days, est. 10 B.P.D. and went dead; reperf. csg. 2,995-3,045 ft. and tstg. 3,064 ft.; O.T.D. 3,145 ft.; treated with 500 gal. acd.; W.O.; hole full of oil.

A. L. Sutton No. 1 Frost Lbr. Co., C NE SE Sec. 35-11-15. Set 13⅜-in. csg. 400 ft.

La Salle Parish

Stovall Drlg. Co. No. 4-B Russell, NW cor. Sec. 25-10-1e. S.D. 1,054 ft.; high wtr.

G. C. Walsenham No. 3 Dean, NE cor. SE Sec. 23-9-1e. Set 6⅝-in. csg. 1,638 ft.; T.D. 1,640 ft.; W.O.C.

Natchitoches Parish

Jack Lent et al No. 1 Whatley, SW cor. Sec. 17-10-10. S.O.&G. reported at 1,490-1,516 ft.; D.S.T. 3,282-96 ft.; tstd. 100 ft. mud cut with 40-grv. oil; P.B. 3,300 ft.; set 6⅝-in. csg. 3,282 ft.; bld. down 600 ft. of bttm.; S.S.O.; arng. set tbg. and swb.

Red River Parish

H. B. Schumacher No. 1 Crichton, SW cor. NW Sec. 18-13-10. Set 8-in. csg. 1,065 ft.; tstd. S.S.O.; S.D. 1,450 ft.

Sabine Parish

Cantwell & Quick No. 1 Sabine, NE cor. SE NE Sec. 8-7-13. R.U.

Geo. Ellis No. 1 Walker, 500 ft. NW cor. NW SE Sec. 8-4-12. Set 12½-in. csg. 276 ft.; reported S.O. 2,180 ft. and 2,263-65 ft.; rng. csg. 2,269 ft.; cd. sdy. sh. 2,265-69 ft.; no show.

A. B. House No. 1 Sabine, NW NW Sec. 23-7-14. 8-in. csg. 2,134 ft.; used 7,000 gal. acd.; tstd. dry; cond. mud 3,642 ft.; arng. set 7-in. 3,500 ft.; T.D. 3,642 ft.

D. N. Jolley No. 1 Summers, C SW NE Sec. 14-7-13. Set 10-in. csg. 100 ft.; set 7-in. csg. 2,188 ft.; T.D. 2,632 ft.; used 3,000 gal. acd.; tstd. S.O. 2,615 ft.; W.O.

Major Oil Co. No. 2-C Bowman Hicks, C NW NE Sec. 4-7-12. Set 7-in. csg. 2,492 ft.; arng. acdz. 2,700 ft.

Sutton Zwolle Oil Co. No. 2 Bowman Hicks, NW cor. SW NW Sec. 6-7-13. T. chk. rk. 2,069 ft.; set 6-in. csg. 2,070 ft.; arng. test 2,512 ft.

Voline Oil Co. No. 1 Sabine, NE cor. NW NW Sec. 23-7-14. Reported S.O. in sdy. L. 3,760-3,805 ft.; set 6⅝-in. csg. 3,760 ft.; T.D. 3,805 ft.; tstd. dry 3,805 ft.; S.W. broke in; believe csg. seat gave way; tstd. formation 3,805-3,976 ft.; dry; recmtd. 6⅝-in. csg. 3,760 ft.; W.O.C.; T.D. 3,976 ft.; tstd. S.W. 3,760 ft.; P.B. 2,250 ft.; arng. perf. & tst. 2,250 ft.

Williams & Spiers No. 1 Byrd, SW cor. SE NW Sec. 1-7-11. R.U.

Tensas Parish

H. V. Schumacher No. 4 Mound Plantation, Sec. 29-11-12e. S.D. 3,002 ft.

Union Parish

Standard Oil Co. of La. and Joe Modisett No. 1-B Frost Lbr. Ind., Sec. 14-23n-2w. Drlg. sh.&bldrs. 2,020 ft.

Webster Parish

R. L. Fisher et al No. 1 S. P. D. Coyle, 660 ft. N and 1,880 ft. E of SW cor. Sec. 23-21-10. Holly. sd. 5,544-59 ft. and 5,809-16 ft.; set 5½-in. csg. 5,782 ft.; T.D. 5,998 ft.; tstd. S.G.; swbd. S.O.& G.; plg. tbg.; perf. csg. 5,543-59 ft.; flwd. 63 B.O. in 3 hrs. then flwd. est. 8 bbls. dist. per hr. on ⅝-in. ck. with est. 4,000,000 cu. ft. gas daily; comp.; C.I.R.P. 1,400 lbs.

Hassie Hunt No. 1 Hodges, C SE SE Sec. 11-21-10. Set 13⅜-in. csg.; W.O.C.

Hassie Hunt No. 11 Davis, C SE SW Sec. 13-21-10. Drlg. L.&sh. 4,854 ft.

Hunt Oil Co. No. 4 Bodcaw-Stewart, 2-155 ft. N and 660 ft. E. SW cor. Sec. 34-21-10. Holly. sd. 5,821-47 ft.; set 9⅝-in. csg. 5,802 ft.; tstd. S.O.&G. in Holly. sd.; T. "D" sd. 8,245-63 ft.; Bdcw. sd. 8,340-81 ft. (dist.); set 7-in. csg. 8,429 ft.; T.D. 8,431 ft.; recmtd.; W.O.C.

Hunt Oil Co. No. 5 Bodcaw-Stewart, NW cor. NE Sec. 33-21-10. Hollwy. sd. 5,734-63 ft. and 5,885-95 ft., oil; set 9⅝-in. csg. 5,938 ft.; drlg. sh.&L. 7,695 ft.

Hunt Oil Co. No. 6 Webb, C NE SE Sec. 14-21-10. Set 13⅜-in. csg. 628 ft.; Holloway sd. 5,690-5,700 ft. and 5,814-24 ft. (oil); set 9⅝-in. csg. 5,655 ft.

Magnolia Pet. Co. No. 1 Cox, C NW SW Sec. 15-21-10. Set 13⅜-in. csg. 847 ft.; 9⅝-in. csg. 5,868 ft.; drlg. sd.&sh. 7,943 ft.

Magnolia Pet. Co. and Ohio Oil Co. No. 1 Coyle-Hodges Unit, SW cor. NW Sec. 21-21-10. Set 9⅝-in. csg. 5,927 ft.; drlg. sdy. sh. 7,462 ft.

Magnolia Pet. Co. No. 1 Roseberry Unit, 20 ft. N and W. C SE Sec. 29-23-9. Set 13⅜-in. csg. 887 ft.; T. Pettit L. 5,725 ft.; S.O. 5,764-66 ft.; T. Tr. Pk. 5,900 ft.; set 9⅝-in. csg. 5,962 ft.; T. lwr. Marine 7,850 ft.; T. Bdcw. sd. 8,289 ft., S.W.; T. Davis sd. 8,548 ft.; broken gas and dist. sd. 9,145-82 ft.; cg. ahead 9,297 ft.

Midstates Oil Corp. No. 1 Giddens, 100 ft. NW cor. SW SW Sec. 30-21-9. Set 13-in. csg. 100 ft.; drlg. L.&sh. 5,680 ft.

Union Prod. Co. No. 1 Walker Unit, 50 ft. S. C SE Sec. 30-18-8. Set 9⅝-in. csg. 6,490 ft.; T. Pettit 6,665 ft.; T. Tr. Pk. 6,910 ft.; drlg. sd.&sh. 8,387 ft.

SOUTH LOUISIANA FIELDS

Abbeville—Vermilion Parish

Continental Oil Co. No. 1 Franciol, Sec. 67-12s-3e. Drk.

Continental Oil Co. No. 1 Lucion Duhon, Sec. 17-12s-3e. Drlg. sd.&gvl. 280 ft.

Bancroft—Beauregard Parish

Republic Prod. Co. No. 6 Columbia Ld. & Tbr. Co., Sec. 15-6s-13w. Cg. sh. 7,305 ft.

Republic Prod. Co. No. 4 Lutcher Moore Lbr. Co., Sec. 16-6s-13w. Drk.

Republic Prod. Co. No. 2 Whitman, Sec 15-6s-13w. Drlg. sh. 3,672 ft.

Bateman Lake—St. Mary Parish

Texas Co. No. 2 State-Bateman Lake, Sec. 21-16s-12e. 13⅜-in. csg. 1,700 ft.; drlg. sdy. sh. 6,412 ft.

Texas Co. No. 2 Wax Bayou Co., Sec. 21-16s-12e. Drlg. sdy. sh.&L. 5,825 ft.

Baton Rouge—East Baton Rouge Parish

Guaranty Oil Co. No. 1 D. J. Morgan. R.U.

Geo. Hells et al No. 1 McInnis, Sec. 36-8s-1w. Loc.

Bay St. Elaine—Terrebonne Parish

Texas Co. No. 2 L.L.&E., Bay St. Elaine, Sec. 18-22s-18e. T.D. 6,500 ft.; 9⅝-in. csg. 6,020 ft.; csg. collapsed; sdtrkd.; T.D. 6,500 ft.; mixing mud.

Bayou Blue—Iberville Parish

Humble O. & R. Co. No. 11 Wilberts, Sec. 67-9s-11e. Loc.

Bayou Choctaw—West Baton Rouge

La. Crusader No. 5 Schwing, Sec. 29-8s-11e. 9⅝-in. csg. 2,250 ft.; T.D. 4,755 ft.; P.B. 4,200 ft.; sdtrkd. 4,214 ft.; T.D. 7,878 ft.; P.B. 7,530 ft.; stk. D.S.; P.B. 5,800 ft.; sdtrkd.; T.D. 5,890 ft.; P.B. 5,200 ft.; T.D. 8,648 ft.; stk. D.S.; cutting and pulling.

La. Crusader No. 6 Schwing, Sec. 29-8s-11e. T.D. 8,609 ft.; 7-in. csg. 8,609 ft.

Bayou des Allemands—St. Charles Parish

Amerada Pet. Corp. No. 3 St. Charles Ld. Co., Sec. 13-15s-20e. Cd. oil sd. 6,765-66 ft.; drlg. sh. 9,312 ft.

Amerada Pet. Corp. No. 4 St. Charles Ld. Co., Sec. 13-15s-2e. Loc.

Caillou Island—Terrebonne Parish

Texas Co. No. 29 State, Sec. 17-23s-20e. Rig.

Texas Co. No. 54 State, Sec. 20-23s-20e. T.D. 4,283 ft.; 7⅝-in. csg. 4,276 ft.; no report.

Cameron Meadows—Cameron

Burten-Sutton Oil Co. No. 26 Sch. Ld., Sec. 16-14s-13w. T.D. 2,465 ft.; 13⅜-in. csg. 2,465 ft.; T.D. 6,564 ft.; P.B. sdtrkd.; drlg. sd.&sh. 7,182 ft.

Chacahoula—La Fourche Parish

Sun Oil Co. No. 5 Dibert, Stark & Brown Cypress Co., Sec. 70-15s-15e. 16-in. csg. 110 ft.; 10¾-in. csg. 1,865 ft.; T.D. 6,055 ft.; stk. D.S.; P.B. and sdtrkd. at

LEGAL

Sale of oil and gas leases—Department of the Interior, General Land Office, Washington, D. C. Notice is given that the following described lands and deposits of oil and gas therein contained are offered to the qualified bidder of the highest bonus per acre for leasing, pursuant to section 17 of the leasing act of February 25, 1920 (41 Stat. 437), as amended by the act of August 21, 1935 (49 Stat. 674), at the royalty rate scale in the lease form shown in Circular 1386: Unit No. 1, the principal island, East Timbalier Island, known locally as Bird Island, located in fractional Secs. 34, 35 and 36, T. 23 S., R. 21 E., Secs. 2 and 3, T. 24 S., R. 21 E., and Sec. 31, T. 23 S., R. 22 E., Louisiana Meridian, situated on the Gulf Coast of La Fourche Parish, State of Louisiana, lying above the elevation of mean high tide, containing 295.77 acres, more or less. Unit No. 2, two islands, adjoining Unit No. 1 in a northeasterly direction between said principal island and Raccoon Pass, Island No. 1 located in fractional Sec. 31, and Island No. 2 located in fractional Sec. 32, both in T. 23 S., R. 22 E., Louisiana Meridian, situated on the Gulf Coast of La Fourche Parish, State of Louisiana, lying above the elevation of mean high tide, containing 11.69 and 69.29 acres, respectively, more or less. Sealed bids will be received in the office of the Secretary of the Interior up to 12:00 o'clock (noon), April 3, 1939. Bids must be submitted on each unit separately but both units, if awarded to the same bidder, may be included in a single lease. Each bidder must submit a certified or cashier's check or draft for 1/5 of the amount bid, payable to the order of the Secretary of the Interior, and furnish a showing of qualifications as required by section 7 of Circular 1386. The remaining 4/5, together with the annual rental at the rate of $1 per acre, must be paid by the successful bidder prior to the issuance of lease, and the deposits of other bidders will be returned. The envelopes should be marked plainly "Bid for Unit No. . . . . (1 or 2), East Timbalier Area. Not to be opened before noon, April 3, 1939." The bidders are warned against violations of the provisions of Sec. 59 of the United States Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. Protests by the State of Louisiana and others claiming under the State against the granting of Government leases for the group of islands on the ground that they are the property of the State were overruled by the Secretary of the Interior in a decision rendered July 29, 1938 (A.21589), after an oral hearing at which the protestants were represented. The Secretary held that the United States has asserted ownership of and jurisdiction over East Timbalier Island for more than 100 years and that the group of islands are public lands of the United States. In the interest of securing full and unrestrained bidding, assurance is given to all bidders that the United States will defend its title to the Islands on its own behalf in any litigation instituted in which, in its judgment, any issue of title to the Islands is probably and approximately raised. In the event litigation is instituted in which title to the Islands is involved and the claim of title of any adverse party is ultimately sustained, the full amount of bonus paid by the successful bidder will be returned to him. Commissioner, General Land Office.

3,718 ft.; drld. to T.D. 4,312 ft.; P.B. 1,850 ft.; W.O.C.

Sun Oil Co. No. 4 Delbert Stark and Brown Cypress Co., Sec. 70-15s-15e T.D. 7,794 ft.; P.B. 6,764 ft.; sdtrkd.; T.D. 8,268 ft.; stk. D.S.; shot at 8,195 ft.; pulling.

Chalkley Field—Cameron Parish

Humble O. & R. Co. No. 2 Cameron Par Sch. Ld., Sec. 16-12s-6w. T.D. 8,700 ft.; run electrical survey.

Humble O. & R. Co. No. 2 Sweet Lake Ld. & Oil Co., Sec. 8-12s-6w. Loc.

Charenton—St. Mary Parish

Commerce Oil Co. No. 1 T. Brulation, Sec. 19-13s-10e. Loc.

Edmont Oil Co. No. 2 Blanchard, Sec. 21-13s-9e. T.D. 1,148 ft.; 5½-in. csg. 1,141 ft.; tstd. S.W.; P.B. 1,132 ft.; perf. csg. 1,125-32 ft.; W.O.S.R.

Kinsley Oil, Inc., No. 1-B Hertel, Sec. 30-13s-9e. Loc.

Pan American Prod. Co. No. 1 Achee, Sec. 21-13s-9e. Loc.

Pan American Prod. Co. No. 12 Laws Realty Co., Sec. 36-13s-9e. 8⅝-in. csg. 985 ft.; drlg. sdy. sh. 5,840 ft.

Pan American Prod. Co. No. 6 Robichaux, Sec. 11-13s-9e. T.D. 2,618 ft.; 7-in. csg. 2,604 ft.; I.P. 373 bbls. P.L.O. per day; ¼-in. ck.

J. P. Scranton No. 1 State Bayou, Sec. 30-13s-10e. Cg. sh. 7,489 ft.

Chenevville—Rapides Parish

Sid Richardson No. 1 Weil Co., Inc., Sec. 55-1s-2e. Drlg. 50 ft.

Texas Canadian Oil Co. No. 1 Myrtle B. Pope, Sec. 4-1s-2e. R.U.

Convent—St. James Parish

Continental Oil Co. No. 2 Realty Operators, Inc., Sec. 16. 13⅜-in. csg. 1,492 ft.; T.D. 7,889 ft.; P.B. 7,275 ft.; sdtrkd. 7,305 ft.; T.D. 8,235 ft.; well blew out; caught fire; backing off D. P. with Edwards reversing tool at 4,350 ft.

Creole—Cameron Parish

Superior Oil Co. No. 5 State-Gulf of Mexico, Sec. 4-15s-8w. T.D. 4,253 ft.; P.B.; sdtrkd.; T.D. 7,192 ft.; 5½-in. csg. 6,951 ft.; perf. csg. 6,847-54 ft.; flwg. gas and dist.

Darrow—Ascension Parish

Humble O. & R. Co. No. 15 Gumbel, Sec. 33-10s-2e. Drlg. sh. 6,447 ft.

Kiva Oil Co. No. 1 Duplessis, Sec. 69-10s-2w. S.D. 2,523 ft.

Eola—Avoyelles Parish

J. E. Jones No. 1 Haas Inv. Co., Sec. 8-2s-3e. R.U.

O'Meara Bros. No. 1 W. F. Kelley, Sec. 7-2s-3e. 13⅜-in. csg. 15 ft.; W.O. permit.

Pomo Prod. Co. No. 1 S. W. Sentel, Sec. 5-2s-3e. S.D. 6,387 ft.

Sid Richardson No. 2 Haas Inv. Co., Sec. 7-2s-3e. T.D. 1,428 ft.; 10¾-in. csg. 1,428 ft.; drlg. sh. 7,120 ft.; top Cock. 6,506 ft.; oil sd. 6,506-11 ft.; S.W. sd. 6,511-21 ft.; T. Sparta 7,345 ft.; sd.; oil odor; cd. 7,475-81 ft.; cg. sh. 8,632 ft.; cd. Wlx. sd. 8,448-8,561 ft.

Sid Richardson No. 3 Haas Inv. Co., Sec. 7-2s-3e. Cg. sd.&sh. 8,506 ft.; T. Wlx. 8,469 ft.

Sid Richardson No. 1 State Bayou, Sec. 7-7s-2e. Loc.

Fausse Point—Iberia Parish

Texas Co. No. 5 State Lake-Fausse Point, Sec. 35-11s-8e. T.D. 11,504 ft.; run electrical survey.

Gibson—Terrebonne Parish

Shell Pet. Corp. No. 3 R.E.K., Sec. 40-17s-15e. Dredge canal.

Gillis—Calcasieu Parish

Fohs Oil Co. No. 1 Green Heres, Sec. 11-9s-8w. T.D. 5,504 ft.; abd.

Union Sulphur Co. No. 8 Kaufman, Sec. 7-9s-8w. Drlg. sh. 4,267 ft.

Golden Meadows—La Fourche Parish

Martex Pet. Corp. No. 1 Falgout Holding Co., Inc., Sec. 9-19s-22e. Cd. sh.& sd.; O.S. 2,636-45 ft. and oil sd. 2,645-54 ft.; drlg. sh. 5,036 ft.

Grand Bay—Plaquemines Parish

Gulf Oil Corp. No. 4 Grand Prairie Lve. Dist., Sec. 48-20s-18e. Loc.

Gulf Oil Corp. No. 2 State, Sec. 6-20s-19e. Canal completed.

Hackberry—Cameron Parish

F. W. Bennett No. 1 Bickford, Sec. 37-12s-10w. 7-in. csg. 7,037 ft.; cg. sdy. sh. 7,325 ft.

Gulf Oil Corp. No. 25-A Erwin, Sec. 13-12s-10w. Drk.

O'Meara Bros. No. 1 Mary E. Jones, Sec. 38-12s-10w. Bldg. drk.

Superior Oil Co. No. 2-C Kaough, Sec. 30-12s-10w. Drlg. sh. 6,994 ft.

Texas Co. No. 25-B State, Twp. 12s-9w. Drlg. sd.&sh. 2,149 ft.

Union Sulphur Co. No. 12 Doiron, Sec. 37-12s-10w. Drlg. sd.&sh. 6,425 ft.

Union Sulphur Co. No. 13 Doiron, Sec. 37-12s-10w. Drlg. sh.&L. 4,946 ft.

Union Sulphur Co. No. 1 Josephine O'Quinn, Sec. 37-12s-10w. T.D. 5,164 ft.; fsg.

Union Sulphur Co. No. 45 Watkins, Sec. 13-12s-10w. T.D. 3,203 ft.; P.B. 1,400 ft.; sdtrkd. 1,483 ft.; T.D. 3,211 ft.; 5-in. csg. 3,203 ft.

Horseshoe Bayou—St. Mary Parish

Texas Co. No. 2 State, Sec. 37-17s-9e. 9⅝-in. csg. 11,631 ft.; T.D. 12,770 ft.; set 1,659 ft. of 6⅝-in. csg. at 12,645 ft.; set 70 ft. of 6⅝-in. csg. 8,473 ft.; prep. to perf. csg. 11,782-11,847 ft.; hung slotted pipe; S.D.

Jefferson Island—Iberia Parish

Texas Co. No. 2 Jefferson Island, Sec. 58-12-5e. 18⅝-in. csg. 40 ft.; T.D. 8,455 ft.; 7⅝-in. csg. 8,451 ft.

Texas Co. No. 2 State-Lake Peigneur, Twp. 12s-5w. Drlg. sdy. L. 3,713 ft.

Jennings—Acadia Parish

W. T. Burton No. 6 Roboria, Sec. 41-9s-2w. 7-in. csg. 6,721 ft.; fsg. tbg.; T.D. 6,997 ft.; sdtrkd. at 6,118 ft.; drld. to 6,178 ft.; sdtrkd. at 6,023 ft.; T.D. 6,732 ft.; trying to drill by fish; P.B. 6,104 ft.; W.O.C.; sdtrkd. 6,020 ft.; T.D. 6,056 ft.; 7-in. csg. 2,203 ft. and 10¾-in. csg. 2,108 ft.; sdtrkd.; drld. into old hole; P.B.; sdtrkd. 2,302 ft.; T.D. 6,763 ft.; 7-in. csg. 6,711 ft.; perf. csg. 6,292-6,430 ft.; flwd. some oil, then went dead; prep. to W.O.

Glassell & Glassell No. 5 McFarlain, Sec. 41-9s-2w. T.D. 7,268 ft.; 6-in. csg. 7,268 ft.; perf. csg. 6,980-7,195 ft.; tstg.

Glassell & Glassell No. 6 McFarlain, Sec. 41-9s-2w. T.D. 7,527 ft.; 6⅝-in. csg. 7,522 ft.; perf. csg. 7,340-7,440 ft.; I.P. 482 B.P.D.; 14/64-in. ck.

Glassell & Glassell No. 7 McFarlain, Sec. 41-9s-2w. Drk.

Gulf Oil Corp. No. 41 Arnaudet, Sec. 47-9s-2w. Drlg. sd. 1,041 ft.

Shell Pet. Corp. No. 6 Conover, Sec. 40-17s-15e. R.U.

Shell Pet. Corp. No. 1 Prather. T.D. 7,392 ft.; I.P. 471 B.P.D.; 14/64-in. ck.

Stanolind O. & G. Co. No. 114 Crowley Oil & Mineral Co., Sec. 48-9s-2w. R.U.

Lafitte—Jefferson Parish

Texas Co. No. 2 State-Bayou Norman, Sec. 21-17s-24e. Dredge canal.

Lake Mongoulois—St. Martin Parish

Texas Co. No. 7 State, Sec. 10-10s-9e. Driving piling.

Lake Pelto—Terrebonne Parish

Texas Co. No. 23 State, Twp. 23s-18e. T. salt 6,055 ft.; T.D. 6,225 ft., salt; P.B. 4,750 ft.; W.O.C.

Lirette—Terrebonne Parish

Humble O. & R. Co. No. 2 H. J. Ellender, Sec. 32-19s-19e. Cd. sd. S.G. 10,465-74 ft.; T.D. 10,494 ft.; rmg.

Lockport—Cameron Parish

Continental Oil Co. No. 2 J. H. Moss, Sec. 8-10s-9w. Drlg. sd.&sh. 3,349 ft.

New Iberia—Iberia Parish

Wm. Helis No. 7 Bolivar, Sec. 56-12s-7e. Drlg. sh. 2,691 ft.

Wm. Helis No. 8 Bullock, Sec. 25-12s-7e. Drlg. sd.&sh. 5,511 ft.

Lisbon-Iberia Oil Corp. No. 7 Gulf fee, Sec. 25-12s-7e. T.D. 4,155 ft.; rmg.

Texas Co. No. 2 Bryant, Sec. 25-12s-7e. R.U.

Texas Co. No. 6 Bryant, Sec. 25-12s-7e. R.U.

Texas Co. No. 1 DeCuir, Sec. 25-12s-7e. Drlg. sh.&L. 5,198 ft.

Texas Co. No. 2 Gonsoulin, Sec. 13-12s-7e. Cg. sd. 9,039 ft.

Texas Co. No. 2-A Hanzon, Sec. 54-12s-7e. T.D. 8,101 ft.; 7⅝-in. csg. 8,075 ft. drlg. sh. 8,116 ft.

Texas Co. No. 1 Renaudet et al, Sec. 71-12s-7e. T.D. 8,343 ft.; 9⅝-in. csg. 8,338 ft.; drlg. sh.&L. 8,543 ft.

North Tepetate—Acadia Parish

Atlantic Ref. Co. No. 1 Aden & Doga, Sec. 11-7s-2w. 16-in. csg. 319 ft.; drlg. sh.&L. 5,718 ft.

Atlantic Ref. Co. No. 4 Klumpp, Sec. 12-7s-2w. T.D. 8,556 ft.; 7-in. csg. 8,556 ft.

Port Barre—St. Landry Parish

Pan American Prod. Co. No. 4 H. L. Garland, Sec. 4-6s-5e. Drk.

Y. D. Spill No. 1 Gaudet, Sec. 4-6s-5e. S.D. 4,700 ft.

Western Gulf Prod. Co. No. 1 Watkins, Sec. 4-6s-5e. Loc.

Potash—Plaquemines Parish

Humble O. & R. Co. No. 38 Orleans Lve. Dist., Sec. 13-18s-15e. 13⅜-in. csg. 2,957 ft.

Quarantine Bay—Plaquemines Parish

Gulf Oil Corp. No. 1-A Plaquemines Ld. Co., Sec. 18-19s-17e. T.D. 5,600 ft.; run 9⅝-in. csg.

Gulf Ref. Co. No. 5 State, Sec. 17-19s-17e. Loc.

Gulf Oil Corp. No. 8 State, Sec. 18-19s-17e. Drlg. sh. 6,110 ft.

Gulf Oil Corp. No. 9 State QQ, Sec. 18-19s-17e. Loc.

South Houma—Terrebonne Parish

Shell Pet. Corp. No. 2 Peters. T.D. 11,000 ft.; abd.

Raceland—La Fourche Parish

Amerada Pet. Corp. No. 1 Godchaux Sugars, Inc., Sec 34-15s-19e 18⅝-in. csg. 262 ft.; T.D. 11,312 ft.; 7-in. csg. 11,312 ft.; T.A.

South Roanoke—Jeff Davis Parish

Continental Oil Co. No. 2 Sturdivant, Sec. 36-10s-4w. Drlg. L. 9,713 ft.

Timbalier Bay—La Fourche Parish

Gulf Oil Corp. No. 4 State. T.D. 7,268 ft.; sdtrkd.; 5-in. csg. 5,320 ft.; T.D. 5,340 ft.; failed to flow; S.D.

Valentine—La Fourche Parish

Pan American Prod. Co. No. 19 Harang, Sec. 8-17s-20e. Drlg. sh. 2,534 ft.

John Vacarro et al No. 2 Acosta Hrs., Sec. 9-17s-20e. Drlg. sh. 3,712 ft.

Villa Platte—Evangeline Parish

Continental Oil Co. No. 1 Crise Deville, Sec. 26-3s-2e. Drlg. sh. 8,878 ft.

Continental Oil Co. No. 3 Haas, Sec. 44-3s-2e. Loc.

Continental Oil Co. No. 3 Opelousas-St. Landry Securities Co., Sec. 44-3s-2e. Drlg. sh. 5,680 ft.

Continental Oil Co. No. 4 Pierre McDaniel, Sec. 45-3s-2e. Loc.

Continental Oil Co. No. 1 Rene McDaniel, Sec. 45-3s-2e. Drlg. sdy. L. 6,169 ft.

Continental Oil Co. No. 1 Tate, Sec. 45-3s-2e. Drlg. sh. 9,250 ft.; will be drilled to Wlx.

Continental Oil Co. No. 3 Ed Tate, Sec. 45-3s-2e. Loc.

Continental Oil Co. No. 3 Vidrine, Deville, Sec. 46-3s-2e. Drlg. sh. 8,926 ft.

Texas Co. No. 3 Marman fee, Sec. 45-3s-2e. R.U.R.

Venice—Plaquemines Parish

Tide Water Asso. Oil Co., Sec. 23-21s-30e. Loc.

Tide Water Asso. Oil Co. No. 4 Buras Levee Dist., Sec. 23-21s-20e. T. salt 3,120 ft.; sdtrkd.; drlg. sh. 2,912 ft.

Vinton—Calcasieu Parish

J. Rediek et al No. 4 Vincent Hrs., Sec. 66-10s-12w. Drlg. sh. 1,120 ft.

Woodlawn—Jeff Davis Parish

Union Sulphur Co. No. 4 Calcasieu Natl. Bnk., Sec. 12-9s-6w. T.D. 8,880 ft.; rmg.

Union Sulphur Co. No. 1 Dovaran-O'Connor, Sec. 12-9s-6w. Drlg. sh. 5,750 ft.

Union Sulphur Co. No. 3 Mrs. O'Miller, Sec. 7-9s-5w. Loc.

Union Sulphur Co. No. 2 Osmon, Sec. 7-9s-5w. T.D. 9,111 ft.; P.B. 5,910 ft.; sdtrkd.; drlg. sd. 7,597 ft.

S. LOUISIANA WILDCATS

Acadia Parish

T. T. Tolson et al No. 1 J. Turner, Sec. 25-7s-1e. M.I.M.

Tri Parish Drillers, Inc., No. 1 Paul Stag, Sec. 4-7s-1w. Drk.

Allen Parish

Bel Oil Corp. No. 1 J. A. Bel, Sec. 22-6s-3w. Drlg. sd.&sh. 595 ft.

Assumption Parish

Humble O. & R. Co. No. 1 Milliken & Farewell Co., Inc., Sec. 79-14s-14e. 13⅜-in. csg. 2,978 ft.; drlg. sh.&sd. 11,855 ft.

Beauregard Parish

Atlantic Ref. Co. No. 1 Lutcher Moore, Sec. 22-3s-11w. Loc.

Atlantic Ref. Co. No. 1 Rice Ld. & Lbr. Co., Sec. 22-3s-11w. Loc.

Atlantic Ref. Co. No. 1-A Rice Ld. & Lbr. Co., Sec. 22-3s-11w. Bldg. road.

Calcasieu Parish

David B. MacDaniel No. 2 Sch. Ld., Sec. 16-9s-7w. 15½-in. csg. 46 ft.; 10¾-in. csg. 1,299 ft.; T.D. 7,890 ft.; S.D.

Iberia Parish

Texas Co. No. 1 Petit Anse, Sec. 59-13s-6e. Drlg. sh. 9,562 ft.

Texas Co. No. 3-B State-Vermilion Bay, Twp. 16s-5e. Drlg. sh. 4,786 ft.

Cameron Parish

Standard Oil Co. of Calif. No. 1 Long Bell Lbr. Co., Sec. 40-17s-15e. Loc.

Superior Oil Co. No. 2 John Sells, Sec. 4-15s-8w. T.D. 7,000 ft.; P.B.; sdtrkd.; drlg. sd.&sh. 2,690 ft.

Superior Oil Co. et al No. 1 State, Grand Lake, Sec. 24-13s-4w. T.D. 103 ft.; driving piling.

Iberville Parish

California Co. No. 1 Schwing Lbr. Co., Sec. 96-10s-10e. 20-in. csg. 177 ft.; 9⅝-in. csg. T.D. 10,106 ft.; twisted off drill collar; P.B.; sdtrkd. 9,613 ft.; drlg. sh. 9,830 ft.

Humble O. & R. Co. No. 1 Iberville Mortgage Loan Co., Inc., Sec. 74-7s-10e. 20-in. csg. 208 ft.; drlg. sh. 5,069 ft.

Shell Pet. Corp. No. 1 Natalbany Lbr. Co., Sec. 18-9s-2e. Drlg. sh. 8,020 ft.

Jeff Davis Parish

Union Sulphur Co. No. 1 H. B. Tietje, Sec. 36-7s-4w. Drlg. sd. 178 ft.

La Fourche Parish

Gulf Oil Corp. No. 1 Grandison Ld. Co., Sec. 14-20s-23e. Drk.

Texas Co. No. 1 L.L.&E. Golden Meadows, Sec. 77-19s-21e. T.D. 10,751 ft.; 9⅝-in. csg. 10,744 ft.; W.O.C.

Orleans Parish

W. T. Burton No. 1 L.&N.R.R., Sec. 18-11s-15e. Drlg. sh. 7,312 ft.

W. T. Burton No. 3 L.&N.R.R., Sec. 25-11s-14e. Loc.

W. T. Burton No. 1-B R. E. E. de Montluzin, Sec. 1-10s-13e. Drk.

Plaquemines Parish

Texas Co. No. 1 L.L.&E., Bastian Bay, Sec. 43-20s-28e. 9⅝-in. csg. 9,540 ft.; T.D. 10,029 ft.; fsg.

Pointe Coupee Parish

Falcon-Seaboard No. 1 J. H. Hobgood, Sec. 8-1s-7e. Bldg. drk.

Rapides Parish

Gulf States Expltn. No. 1 Erwin & Bishop, Sec. 35-1n-3w. Drlg. sh.&L. 4,310 ft.

Lyons & Neely No. 1 W. P. Aertker, Sec. 16-4n-1e. Loc.

St. Bernard Parish

Gulf Ref. Co. No. 4-State-R.R. (Lake Borgne), Twp. 12s-15e. 9⅝-in. csg. 8,161 ft.; T.D. 10,632 ft.; P.B. 9,700 ft.; rmd. to 9,658 ft.; lost core bbl.; fsg.

Vendome Pet. Corp. No. 1 Kenilworth Plantation, Sec. 59-13s-14e. 9⅝-in. csg. 10,809 ft.; cd. 10,880-10,900 ft., sdy. sh.; gas odor; cd. gas sd. 10,990-11,050 ft.; drlg. sh. 11,170 ft.; no report.

St. Charles Parish

Texas Co. No. 1 L.L.&E. Paradis, Sec. 39-14s-20e. 9⅝-in. csg. 8,975 ft.; drlg. sh. 9,820 ft.

St. James Parish

Shell Pet. Corp. No. 1 Shexnayder, Sec. 38-12s-15e. 9⅝-in. csg. 8,534 ft.; cg. sh. 10,612 ft.

St. Martin Parish

Magnolia Pet. Co. No. 1 Mercelin, Sec. 8-10s-7e. Drlg. sd.&sh. 7,246 ft.

Roper & Todd No. 1 Levert Plantation, Lot 40, Sec. 42-10s-7e. Loc.

St. Mary Parish

Phillips Pet. Co. No. 1 Whitney Natl. Bnk., Sec. 13-15s-12e. Cg. sd.&sh. 10,131 ft.

Terrebonne Parish

Texas Co. No. 2 State-Coon Point, Twp. 23s-14e. 13⅜-in. csg. 1,900 ft.; T.D. 2,851 ft.; driving piling; bldg. drk.

ARKANSAS

Calhoun County

J. R. Lockhart No. 1 Southern Kraft Corp., SE cor. NW NW Sec. 17-14-13. O.W.W.O.; (formerly C. E. Murdock); O.T.D. 3,291 ft.; wshg. to bttm.

Columbia County

Atlantic Ref. Co. No. 1 A. S. Crisp, NW cor. NW NE Sec. 23-17-20. T.D. 7,591 ft.; Sm. L.; rmg. down.

Atlantic Ref. Co. No. 1-B Garrett, C NW NW Sec. 24-17-20. Set 16-in. csg. 130 ft.; T. Bknr. 7,233 ft.; T. por. zones 7,305 and 7,316 ft.; sat. L. 7,316-7,510 ft.; rmd. to 7,432 ft.; set 5½-in. csg. 7,510 ft.; perf. 7,450-92 ft.; comp.; 750 B.P.D.; 14/64-in. ck.; C.P. 1,400 lbs.

Hassie Hunt No. 1 Tally, Sec. 14-17-20. Drlg. rd.&gr. sh. 3,885 ft.

Normandie Oil Co. No. 1-B L. Garrett, C NE SW Sec. 18-17-20. Set 16-in. csg. 120 ft.; T.D. 7,535 ft.; T. Smkvr. L. 7,521 ft.; prep. set csg.

Phillips Pet. Co. No. 1 Askew Unit, C NE NW Sec. 4-17-21. Drlg. 237 ft.

Southwood Oil Co., Inc., No. 1-B L. Garrett, C SW NW Sec. 24-19n-7e. R.U.

Southwood Oil Co. No. 1 L. A. Grelling, C NE NW Sec. 23-17-20. T.D. 3,790 ft.; prep. whipstock.

Southwood Oil Co., Inc., No. 2 Grelling. C SW NE Sec. 23-17-20. R.U.

Southwood Oil Co., Inc., No. 2 J. O. Hutcheson, C SE SW Sec. 14-17-20. 16-in. csg. 135 ft.; T. Bknr. 7,318 ft.; T. Smkvr. L. 7,352 ft.; por. zones 7,379 and 7,382 ft.; 7-in. 7,506 ft.; comp. 420 B.P.D.; 12/64-in. ck.; T.P. 1,300 lbs.; C.P. 1,625 lbs.; T.D. 7,526 ft.

Standard Oil Co. of La. No. 1 M. Harris, NE cor. NE SW Sec. 15-17-19. Drlg. 4,600 ft.

Alice Sydney Oil Co. No. 1 Crisp, Sec. 23-17-20. 16-in. csg. 127 ft.; T. Bknr. 7,291 ft.; T. Smkvr. L. 7,336 ft.; T. porosity zones 7,362 and 7,382 ft.; 7-in. csg. 7,505 ft.; comp.; 460 B.P.D.; 12/64-in. ck.; T.P. 400 lbs.; C.P. 1,400 lbs.; T.D. 7,525 ft.

Tide Water Oil Co. No. 1 Price, C NE SW Sec. 15-18-19. Drlg. 3,797 ft.

Vaughn & Hunt No. 1 Crisp, Sec. 23-17-20. Drlg. 4,040 ft.

Hot Spring County

John H. James No. 1 Sturgess Lbr. Co., SW cor. SW SE Sec. 24-6-18. 10-in. csg. 58 ft.; cd. hd. dense gr. L. 964-78 ft.; T.D. 1,048 ft.; S.O. reported 480-82 ft. and 819-21 ft.; hd. sd.; S.D.; W. O. core bbl.

Lafayette County

Standard Oil Co. of La. No. 5 McKean, SW cor. NW SE Sec. 7-16-22. Set 9⅝-in. csg. 2,047 ft.; drlg. 4,912 ft.

Little River County

C. & M. Drlg. Co. No. 1 Strawn, SW cor. SE Sec. 20-10-32. Cd. 1,270-80 ft.; sh.& wtr. sd.; reported S.O. 1,365-70 ft.; 1,542-64 ft. sd. and 1,564-74 ft. sdy. L.; S.D.; W.O. 1,574 ft.

Joe G. Strahan et al No. 2 Dierks Lbr. Co., Sec. 21-12-28. S.D. for D.S. 3,797 ft.

Lonoke County

Cabot Drlg. Club, Inc., No. 1 Benson Townsite, Sec. 18-4n-9w. O.W.W.O.; O. T.D. 2,760 ft.; M.I. rig to dpn.

Lonoke-Prairie Dev. Co. No. 1 T. Young, C NW NW Sec. 8-3n-7w. Hole clean; U.R. 8¼-in. csg. 236 ft.; T.D. 300 ft., sd.; S.D.

W. L. Tedford No. 1 Anderson. 8-in. 400 ft.; arng. run 5-in. csg. on pkr. to S.O. wtr. flw.; set 5-in. csg. on pkr. reported 3-ft. sd. 937-40 ft.; bailed dry with S.O.; drld. to 942 ft. and bailed dry; W.O. 942 ft.

Mississippi County

Benedum & Trees Oil Co. No. 1 Mack, 330 ft. SW cor. NW SW Sec. 2-15n-12e. Top Nac. 2,160 ft.; set 7-in. csg. 2,897 ft.; drlg. very hd. gr. L. 4,444 ft.

Ouachita County

Phillips Pet. Co. No. 1 J. D. Reynolds, 330 ft. SE cor. SE NW Sec. 27-15-15. O.W.W.O.; O.T.D. 4,926 ft.; comp. as disc. well, Snow Hill field; drld. hd. dense sol. L. with salty taste to 4,945 ft. and pmpd. 1,200 bbls. S.W. daily, no S.O.; recmtd. and P.B. 4,695 ft.; W. O.C.

Union County—Schuler

Lion Oil Ref. Co. No. 1 Calloway, NE cor. SE SE Sec. 13-18-18. Drlg. 1,260 ft.

Lion Oil Ref. Co. No. 2 Henry, C N SE SE Sec. 12-18-18. Set 16-in. csg. 115 ft.; 10¾-in. csg. 1,920 ft.; T.D. 7,632 ft.; rmg. to bttm. to core ahead.

Lion Oil Ref. Co. No. 1 Murphy Ld. Co., Sec. 13-18-18. Drlg. rd.&gr. sh. 5,400 ft.

Phillips Pet. Co. No. 4 Brian, NE cor. NE SE Sec. 13-18-18. Set 16-in. 192 ft.

Phillips Pet. Co. No. 10 Sewell, C S½ Lot 4, SW Sec. 7-18-17. Set 16-in. csg. 190 ft.

Union County—Other

Goodwin & Markwick No. 1 Union Sawmill Co., C NW NW SE Sec. 13-18-18. Drlg. 600 ft.

Hollyfield & McFarlane No. 1 S. Murphy, Sec. 9-16-15. T. Mkns. sd. 2,336-49 ft.; set 9⅝-in. csg. 2,385 ft.; T.D. 2,392 ft.; comp.; pmpg. 65 B.P.D.; clean oil; perf. 2,338-48 ft.

E. M. Jones No. 3 J. C. Morgan, Sec. 13-18-18. Drlg. 2,180 ft.

E. M. Jones No. 4 J. C. Morgan, C N½ NE NW Sec. 13-18-18. Drlg. 2,125 ft.

Lion Oil Ref. Co. No. 1 Clay, Sec. 12-18-18. Drlg. 2,337 ft.

J. R. Lockhart No. 1-A Raulston, NE cor. SW SE Sec. 12-17-14. Comp.; pmpg. 900 bbls. S.W.; 5 B.O.; T.D. 3,037 ft.

Oliphant Oil Co. No. 1 Union Sawmill Co., C SW NW Sec. 22-19-14. M.I. rig.

Sklar Oil Corp. No. 10 Murphy, SW NE Sec. 9-16-15. Sat. sd. 2,336-61 ft. (Meakin); set 7-in. csg. 2,385 ft.; perf. 2,338-46 ft.; comp.; pmpg. est. 600 bbls. S.W. and 35 B.O.

Sloan Wells, Tr., No. 4 G. J. Childs, 150 ft. NW cor. NE SW Sec. 8-16-16. O.W. W.O.; O.T.D. 2,656 ft.; fsg. 2,656 ft.

Snuggs Sebersky & Bylick No. 1 J. N. Jerry, NE cor. SE SW Sec. 21-17-14. Cd. S.W. sd. 2,818-21 ft.; S.O. 2,885-90 ft.; D.S.T. 2,881-95 ft.; 15 min.; rec. 250 ft. mud, S.W. and S.O.; cd. sd. 2,993-98 ft. (oil) and 2,998-3,000 ft. (S. W.); S.D. 3,195 ft.; W.O.

White County

G. F. Herlden et al No. 1 M. C. Wells, C SW Sec. 36-9n-8w. R.U.

NORTH MISSISSIPPI

Calhoun County

L. C. Lucas No. 1 E. C. Boland, 400 ft. E and 500 ft. S, NW cor. SW Sec. 9-22n-9e. S.D. 791 ft.

Clarke County

Jeremiah L. Ryan et al No. 1 M. Eddins, 500 ft. SE cor. Sec. 29-2n-14e. S.D. 291 ft.

Hinds County

G. Jefferys No. 1 Gaddis Farms, Inc., NW cor. SE Sec. 26-7n-4w. S.D. 3,448 ft.

Cleve Love et al No. 1 S. F. Johnson, NE cor. Sec. 29-6n-1w. S.D. 5,218 ft., sd.; arng. D.D.; will erect large steel drk.

Madison Parish

Union Prod. Co. No. 1 Anderson, Sec. 12-8n-1w. Drlg. 359 ft.; set 13⅜-in. csg. 300 ft.; drlg. sh.&sd. 1,320 ft.

Simpson County

Cleve Love No. 1 N. E. Garner, SW cor. SW NE Sec. 1-10n-17w. S.D. 720 ft.; to resume drlg.

Goodwill O. & G. Co. No. 1 Berry, Sec. 33-2n-4e. S.D. 2,810 ft.

Yalobusha County

Chas. W. Crader et al No. 1 John Bruce James, Sec. 24-11s-6w. S.D. 2,950 ft.

TEXAS

Week Ending March 18

GULF COAST FIELDS

Hastings Field—Brazoria County

Humble O. & R. Co. No. 1 H. L. Beeck, B.S.&F. Sur. No. 6. Loc.

Old Ocean—Brazoria County

Harrison & Abercrombie No. 3 Armstrong Plantation, Polley & Chance Sur. T.D. 10,538 ft.; tstg.

Harrison & Abercrombie No. 5 Armstrong, Polly & Chance Sur. Drlg. sh. &L. 9,036 ft.

Harrison & Abercrombie No. 6 Bernard River Ld. & Dev. Co., C. Breen Sur. 9⅝-in. csg. 6,996 ft.; drlg. sh.&L. 9,739 ft.

Harrison & Abercrombie No. 4 Chenault, C. Breen Sur. 13⅜-in. csg. 1,523 ft.; drlg. 1,870 ft.

Sun Oil Co. No. 1 Borsodi-Elkins, C. Breen Sur. R.U.

Cedar Point—Chambers County

Standard Oil Co. of Texas et al No. 56-94 State. Cg. sdy. sh. 3,020 ft.

Seabreeze—Chambers County

Sun Oil Co. No. 1 Pipkin, W. M. Mays Sur. No. 104. T.D. 8,413 ft.; 7-in. csg. 8,407 ft.; tstd. oil and S.W.; pulling screen and lnr.

Turtle Bay—Chambers County

Stanolind O. & G. Co. No. 1 Tassie Lotz, J. B. Jamison Sur. R.U.

West Columbia—Brazoria County

Frost & Dunman No. 1 E. C. Parker, G. Tennille Sur. T.D. 4,384 ft.; 7⅝-in. csg. 4,384 ft.

General Crude Oil Co. No. 1-B Campbell, S. M. Williams Sur. Drlg. sh. 4,969 ft.

Texas Co. No. 5 Goldman, G. Tennille Sur. R.U.

Texas Co. No. 12 Phillips G. Tennille Sur. Drlg. sh. 2,270 ft.

Green's Lake—Galveston County

Sun Oil Co. No. 3 Houston Farms Dev. Co., D. Buckley Sur. Drlg. sh. 6,666 ft.

League City—Galveston County

Geo. Echols No. 3 Ross-Stewart, Perry & Austin Sur. R.U.

Midstates Oil Co. No. 2-A Maco Stewart, Perry & Austin Sur. Cg. sdy. sh. 10,158 ft.

Phillips Pet. Co. No. 1 Bertha Lobit Wilson, Perry & Austin Sur. Drlg. sh. 7,896 ft.

Phillips Pet Co. No. 1 J. C. Ott, S. F. Austin Sur. Cd. O.S. 7,070-9,110 ft.; T.D. 10,545 ft.; 5½-in. csg. on bttm.; perf. csg. 9,245-63 ft.; flwd. brksh. wtr some oil; perf. csg. 9,242-60 ft.; flwg. into pits; est. 12 B.F.P.H.; ¼-in. ck.; 34% brksh. wtr.; killed to perf. csg. higher.

Phillips Pet. Co. No. 1 Stewart, Title Guaranty, S. F. Austin Sur. Top sd. 9,072 ft.; T.D. 9,274 ft.; P.B.; sdtrkd.; T.D. 9,333 ft.; cd. sd., oil odor 10,313-22 ft.; cg. 10,325 ft.

Salt Dome Oil Corp. No. 2 Ross-Stewart, Perry & Austin Sur. Drlg. sh. 7,036 ft.

West Prod. Co. No. 1 fee, Lot 2, Blk. 5, Perry & Austin Sur. Loc.

Bammel—Harris County

H. M. Harrell et al No. 2 John Ehrhardt, Geo. DeLesdenier Sur. T.D. 6,956 ft.; make D.S.T. of sd. 6,180-83 ft.

Clear Lake—Harris County

Humble O. & R. Co. No. 6-C Humble-West, Geo. B. McKinstry Sur. Drlg. sh. 3,969 ft.

Clinton—Harris County

Stanolind O. & G. Co. No. 2 Edwards, Reels & Trobough Sur. Drk.

Eureka—Harris County

Jack Frazier No. 1 W. T. Helberg, H. Reinerman Sur. R.U.

Houston Oil Co. No. 3 Helberg & Lackner, J. Reinerman Sur. Loc.

Houston Oil Co. No. 2 D. Lackner, H. Reinerman Sur. R.U.

Tide Water Asso. Oil Co. No. 2 Roy J. Reinerman Sur. Drlg. sdy. sh. 7,922 ft.

Fairbanks—Harris County

Kirby Pet. Co. No 1. Daniels, S. S. Reynolds-Sur. Cd. oil sd. 7,227-48½ ft.; T.D. 7,252 ft.; perf. csg. 7,237-39 ft.; flwd. gas and S.W.; sqzd. perf.; reperf. csg. 7,203-11 ft.; C.O.; making 2,500,000 cu. ft. gas; killed; perf. csg. 7,002½-23½ ft.; tstd. gas and dist.; sqzd. off perf.

Sinclair Prairie Oil Co. No. 1 Frazier, J. D. Egbert Sur. Spd.

Sinclair Prairie Oil Co. No. 3 Goodykoontz, W. S. Powell Sur. Loc.

Stanolind O. & G. Co. No. 1 W. F. Jahnke, 148-ac. tr., Sam Lewis Sur. Drlg. sh. 5,734 ft.

Stanolind O. & G. Co. No. 2 Look, S. Lewis Sur. Loc.

Union Prod. Co. No. 1 Murphy, T. M. Dorsett Sur. T.D. 7,028 ft.; D.S.T. 7,009-28 ft.; rec. 1,000 ft. oil; 5½-in. csg. on bttm.; perf. csg.

Friendswood—Harris County

Humble O. & R. Co. No. 10-B Humble-West, Luke Hemenway Sur. T.S. 5,462 ft.; T.D. 6,042 ft.; comp.; no ga.

Humble O. & R. Co. No. 13-B Humble-West, Luke Hemenway Sur. T.S. 6,070 ft.; T.D. 6,075 ft.; tstg.

Humble O. & R. Co. No. 16-B Humble-West, Luke Hemenway Sur. Drlg. sh. 4,036 ft.

Humble O. & R. Co. No. 13 Keisling-Dixon, T. Choate Sur. Cg. sd. 5,939 ft.

Humble O. & R. Co. No. 1 J. T. Moore, A. Whitlock Sur. Drlg. sh. 3,212 ft.

Humble O. & R. Co. No. 9 West Prod. Co., T. Choate Sur. Drlg. sd. 5,546 ft.

Satsuma Field—Harris County

Moore & Ahern et al No. 1 Zagist, F. Fry Sur. Spd.

Cheek—Jefferson County

Geo. H. Echols No. 1 Beaumont Launch Club, C. Hildebrandt Sur. T.D. 7,750 ft.; abd.

Humble O. & R. Co. No. 2 Broussard, C. Hillebrandt Sur. Loc.

Humble O. & R. Co. No. 2 Broussard Tr., C. Hillebrandt Sur. Dig. pits.

Humble O. & R. Co. No. 3 Jefferson Ld. Co., C. Hillebrandt Sur. Top oil sd. 7,714 ft.; T.D. 7,723 ft.; 5½-in. csg. 7,722 ft.

Humble O. & R. Co. No. 1 Pitre, C. Hillebrandt Sur. Top oil sd. 7,714 ft.; T.D. 7,723 ft.; 5½-in. csg. 7,723 ft.

Humble O. & R. Co. No. 1 Margaret Todd, Wm. Carr Sur. Bldg. road.

Shell Pet. Corp. No. 1 Steinhagan, Wm. Carr Sur. Drlg. sh. 7,313 ft.

La Belle—Jefferson County

Sun Oil Co. No. 5 Broussard-Hebert, T. &N.O. Sur. No. 207. R.U.

Cordele—Jackson County

H. J. Porter No. 1 Woussi, Peter White Sur. Loc.

Esperson—Liberty County

General Crude Oil Co. No. 1 Burgess et al, A. McNeil Sur. Drlg. sh. 8,212 ft.

Hardin—Liberty County

Atlantic Ref. Co. No. 1 Humphrey, F. Hardin Sur. Drlg. sh.&L. 6,943 ft.

Gulf Oil Corp. No. 4 Cessna, H. B. Johnston Sur. R.U.

Texas Co. No. 2 Smith, A. A. Hardin Sur. Drlg. sh. 544 ft.

Orange—Orange County

Continental Oil Co. No. 18 Chesson, Wm. Dyson Sur. T.D. 5,512 ft.; reperf. csg. 5,491-95 ft.; cleaned hole; run screen and lnr.

Gulf Oil Corp. No. 2 Laflour, Wm. Dyson Sur. T.D. 5,757 ft.; 5½-in. csg. 5,712 ft.; failed to flow; drlg. 5,810 ft.

Gulf Oil Corp. No. 10-A Winfree, Wm. Dyson Sur. Loc.

John Mayo No. 1 M. J. Williams, Dyson Sur. R.U.

Red Bank Oil Co. et al No. 1 Allie Chesson, Wm. Dyson Sur. T.D. 5,980 ft.; tstg.

Ryan et al No. 3 Chesson, Wm. Dyson Sur. Loc.

Union Prod. Co. No. 5 Lutcher Moore, J. Dyson Sur. Cg. sh. 5,520 ft.

Ace—Polk County

Dick Schwab No. 1-C Kirby-West Lbr. Co., G. A. Thomas Sur. Loc.

Shell Pet. Corp. No. 1 Doucett, P. A. Sublett Sur. Cg. sh. 7,923 ft.

Shell Pet. Corp. No. 2 Doucett, P. A. Sublett Sur. Loc.

Segno—Polk County

Gulf Oil Corp. No. 4 Quinn, A. Morales Sur. R.U.

Gulf Oil Corp. No. 1 Ragan, I.&G.N. Sur. No. 15. R.U.

Gulf Oil Corp. No. 5 Ragan, I.&G.N. Sur. No. 15. Loc.

Gulf Oil Corp. No. 16 Wing, I.&G.N. Sur. No. 14. Drlg. sh. 1,512 ft.

Humble O. & R. Co. No. 11-BX Kirby, M. Victor Sur. Drlg. sh. 6,646 ft.

Spurger—Tyler County

Republic Prod. Co. No. 18 fee, N. Hurd Sur. Drlg. sh.&L. 7,312 ft.

Katy—Waller County

Magnolia Pet. Co. No. 1 Allsup, E. B. Conch Sur., Sec. 108. Loc.

Stanolind O. & G. Co. No. 1 McCarthy, Williamson, H.&T.C. Sur. T.D. 7,300 ft.; W.O.C.

GULF COAST WILDCATS

Brazoria County

Crosby Drlg. Co. No. 1 Geo. S. Wilson, A. C. Reynolds Sur. 10¾-in. csg. 2,925 ft.; T.D. 7,890 ft.; heaving sh.

Fabriguze et al No. 1 Freeport Sulphur, Stephen F. Austin Sur. (Bryan Mound). M.I.M.

Hamman Explth. Co. No. 1 Darrington, Achilles McFarland Sur. 10¾-in. csg. 1,200 ft.; drlg. sh. 6,020 ft.

Housh & Thompson No. 1 Lula Allen, Kate Ehrmann Sur. Loc.

Chambers County

Geo. Anderson No. 1 Julia Casey, W. D. Smith Sur. Loc.

L. D. Roberts No. 1 C. H. Lang, T.&N. O. Sur. No. 35. Drk.; (cor.).

Colorado County

Mills Bennett Prod. Co. No. 1 J. M. Truchard, Ed Curbit Sur. 13⅜-in. csg. 968 ft.; T.D. 7,900 ft.; abd.

Galveston County

Sun Oil Co. No. 2 Cade, A. Dickson Sur. T.D. 8,009 ft.; 9⅝-in. csg. 8,009 ft.; perf. csg. 7,774-78 ft.; tstd. 21 stands I.P. 307 bbls. 34-gr. oil per day; 11/64-in. ck.

Harris County

H. C. Cockburn No. 1 Lena Griffith, Adam Sur. Loc.

Sam Harrison No. 1 Minnetex Co., Wm. Lovett Sur. Drlg. sh. 7,040 ft.

H. H. Givens No. 2 F. K. Adone, David Middleton Sur. Drk.

Midwest Royalty Co. No. 1 Westmoreland Farms, Lot 12, Blk. 39, James Wells Sur. R.U.

Jefferson County

I. E. Harwell No. 1 State, Gulf of Mexico. T.D. 5,840 ft.; D.S. stk.; pulled in two; S.D.

Humble O. & R. Co. No. 13-B McFaddin-State, Sec. 8. 10¾-in. csg. 2,758 ft.; T.D. 5,859 ft.; D.S. stk.; backed off at 3,688 ft.; P.B. 4,220 ft.; sdtrkd.; T.D. 6,014 ft.; sdtrkd.; T.D. 6,115 ft.; P.B.; sdtrkd.; 7-in. csg. 5,919 ft.; drlg. sh. 6,413 ft.

Navarro Oil Co. et al No. 1 T. F. Koch, Flutero Lopez Sur. Drlg. sh. 7,210 ft.

Matagorda County

Maja Oil Co. No. 1 Robbins, A. Sheppard Sur. R.U.

Pierce Est. No. 1-P fee, B. J. Rawls & O. H. Stout Sur. Drlg. sh. 1,967 ft.

Sun Oil Co. No. 1 Cavallin, Theo. F. Koch subd., John Duncan Sur. 9⅝-in. csg. 8,502 ft.; T. gas sd. 9,313 ft.; T.D. 9,582 ft.; 7-in. csg. 9,582 ft.

Montgomery County

Deep South Pet. Co. No. 1-A Foster Lbr. Co., Pryor Bryan Sur. Loc.

O. C. Garvey et al No. 1 Foster Lbr. Co., Neil Martin Sur. Loc.

H. A. Pennington et al No. 1 F. L. Banker, L. M. H. Washington Sur. S.D. 1,033 ft.

J. Smith et al No. 1 J. V. Scott, F. A. B. Wheeler Sur. S.D. 3,623 ft.

Newton County

Sun Oil Co. No. 1 Peavy-Moore Lbr. Co., T.&N.O.R.R. Sur. Drlg. sh. 6,030 ft.

San Jacinto County

J. W. Frazier No. 1 Annie Smith, J. D. Martinez Sur. No. 10. M.I.M.

Carl Keels et al No. 1 Ed Mays, Lot 7, R. O. Lusk Sur. Loc.

Tyler County

J. C. Bonham No. 1 Kountze, F. M. McReynolds Sur. Loc.

Washington County

Mount Selman Oil Co. No. 1 Fritz Fuelberg, John Lightfoot Sur. R.U.

Wharton County

Humble O. & R. Co. No. 1 J. D. Ecker, Beaty Seale & Forwood Sur. Drk.

S. W. TEXAS WILDCATS

Bell County

M. M. Gordon No. 1 Steele, Oliver T. Tyler Sur. S.D. 1,201 ft.

G. P. Shelton et al No. 1 Nelson, Michael Griffin Sur. S.D. 1,208 ft.

Bexar County

Fred Beatty No. 1 Joppich, Iginio Tejado Sur. No. 186. 6⅝-in. csg. 575 ft.; S.D. 803 ft.

H. G. Krumm No. 1 Kempf, Samuel McCollough, Jr., Sur. 54. T.D. 770 ft.; tstg. on pmp.; pmpg. small amt. oil.

L. L. Skaggs No. 1 Braubach, Fernando Rodriquez Sur. S.D. 325 ft.

Blanco County

E. L. Nixon No. 2 Crist, John McClenechen Sur. No. 94. S.D. 285 ft.; abd.

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McGREGOR WORKING BARREL COMPANY

Bradford, Pa. U.S.A.

Brooks County

Humble O. & R. Co. No. 5 McGill Bros., La Blanca gr. Drlg. sh. 5,701 ft.

Caldwell County

Ben H. Fuchs No. 1 Chamberlain, Jos. Burleson Sur. Drlg. 1,239 ft.

Calhoun County

Continental Oil Co. No. 1 J. J. Welder, Eusebio Hidalgo gr. R.U.

Comal County

O. W. Killam No. 1 Gruene, Henry Foster Sur. T.D. 1,742 ft., L.; abd.

De Witt County

Richardson et al No. 1 W. D. McCurdy, John Hunt Sur. T.D. 150 ft.

Duval County

G. C. Glasscock No. 1 Nicholas Garcia, Santa Cruz De Concepcion gr. S.D. 4,039 ft.

Gravis and Doran No. 1 Parr, San An. T.D. 6,281 ft.; P.B. 5,890 ft.; 20-min. D.S.T. 5,860-90 ft. rec. 1,130 ft. gas-cut mud; 7-in. csg. 5,998 ft.; perf. csg. 5,865-74 ft.; tstd. S.W.; prep. to reperf. csg.

Frank Gravis No. 3 Schallert, Seale Morris & Seale Sur. No. 2550. T.D 3,168 ft.; P.B. 1,800 ft.; prep. to sdtrk.

Henderson Coquat et al No. 1 Southland Life Ins. Co., Sec. 7, Ball Ranch subd., Santos Flores gr. R.U.

Luling O. & G. Co. No. 1 Pope Dimitt, Jose Marcelo Ynojosa gr. 10-in. csg. 561 ft.; drlg. sh. 4,025 ft.

Magnolia Pet. Co. No. 1 Denman, Santos Garcia gr. R.U.

J. G. Mayo et al No. 1 Hoffman, San Diego de Arriba gr. Drlg. sd.&sh. 4,325 ft.

Texas Gulf Prod. Co. No. 1 John Dunn, Diego Ynojosa gr. R.U.

Texas Inland Corp. No. 1 Nueces Ld. & Livestock Co., B.S.&F. Sur. No. 175. Abd. 1,217 ft.

Transwestern Oil Co. No. 19 Duval Co. Ranch Co., P. Martinez Sur. 368. Loc.

W. A. Wagner No. 1 D. J. Welkel, John H. Gibson Sur. No. 497. R.U. and S.D.

Goliad County

L. A. Douglas et al No. 1 Geo. A. Ray, S. J. Gomez Sur. R.U.

Eltobilt Oil Co. No. 1 Pettus, Maria De Jesus Yvarvo Sur. Drlg. sh. 5,610 ft.

Martex Oil Co. No. 1 Wm. F. Albrecht, Thos. Hancock Sur. T.D. 5,312 ft.; perf. csg. 5,230-38 ft.; tstg.

Gonzales County

Otton Elder No. 1 Wilkinson, Russell Ward Sur. S.D. 425 ft.

H. F. Hinds No. 1 Dubose, E. G. Coffman Sur. 10-in. csg. 37 ft.; T.D. 2,696 ft.

Guadalupe County

Diamond Half Oil Corp. No. 1 Jacobs, B. Fuqua Sur. Cg. L. 2,948 ft.

Joseph Holefield No. 2 Claud Bredmax, John G. King Sur. R.U.

John Hueners No. 1 Boecker, John Baker Sur. No. 26. S.D. 915 ft.

Hidalgo County

Pan American Prod. Co. No. 1 J. De la Vina Vicente Hinojosa gr. T.D. 8,125 ft.; P.B. 6,391 ft.; D.S.T. 7,985-8,023 ft.; tstd. S.W.; drld. plug; found cmt. soft: P.B. 6,050 ft.; sdtrkd.; T.D. 6,726 ft.; abd.

Jim Hogg County

A. W. Dillard No. 1 Julian Ramirez, John S. Williams Sur. Drlg. sh. 1,639 ft.

Humble O. & R. Co. No. 9 Bass, San Raphael gr. Loc.

Humble O. & R. Co. No. 6 McGill Bros., south offset to No. 8 Bass. Drlg. sh. 4,712 ft.

Humble O. & R. Co. No. 1 Mestena O. & G. Co., Fowler & Rankin subd., Palitos Blanco gr., R. G. Sars Sur. 16-in. csg. 70 ft.; T.D. 2,007 ft.; 10¾-in. csg 1,563 ft.; D.S.T. 5,096-5,116 ft.; S.D. 5,342 ft.

Johnson & Robinson No. 1 Palacios Mary Montgomery Sur. S.D. 2,450 ft.

Neal and Shaw No. 1 Armstrong, Hooper & Wade Sur. M.I.R.

Jim Wells County

F. A. Gillespie & Sons No. 1 Shear, Blk. 24, Adam Beatty & Moulton Sur. 10¾-in. csg. 999 ft.; drlg. sh. 5,347 ft.

Tom Graham No. 1 N. O. Adams, Macellino Lopez gr. T.D. 5,850 ft.; 5½-in. csg. 5,020 ft.; to test sd. 4,928-38 ft.

H. H. Howell No. 1 Charles Muil, Lot 66, L. G. Collins Farm Lots. R.U.

Ike Howeth No. 1 O. S. Adams, Sec. 122, Wm. Adams Sur. R.U.

Magnolia Pet. Co. No. 1 Samuel Maun. Los Olmos y Loma Blanca gr. 7-in. csg. 6,314 ft.; T.D. 7,560 ft.; run elec survey; cmtd. 5-in. lnr. at 7,257 ft.; perf. csg. 7,155-65 ft.; D.S.T. failed; perf. csg. 7,093-7,110 ft.; tstd. S.W.; perf. csg. 6,560-70 ft.; tstg.

W. H. Mathews No. 1 Frances Clark, Los Precenos gr. 10¾-in. csg. 617 ft.; tstd. 450 lbs. press.; 1 qt. oil on D.S. T. 5,141-58 ft.; 5½-in. csg. 5,309 ft.; T.D. 5,319 ft. (cor.); perf. csg. 5,202-12 ft.; tstd. S.W.; perf. csg. 5,138-42 ft.; flwd. 5 bbls. dist. per day; 9/64-in. ck.; killed well; reperf. csg. 4,825-35 ft.; flwd. est. 25 B.F.P.D., 99% S.W.; T.P. 140 lbs.; C.P. 720 lbs.; perf. csg. 4,805-18 ft.; rec. 4,600 ft. S.W.; perf. csg. 4,805-14 ft.; flwg. gas, spray of dist.; 9/64-in. ck.; T.P. 250 lbs.; C.P. 275 lbs.; S.I.

Parr Drlg. Co. et al No. 1 W. G. Carter, LaVaca gr. T.D. 5,415 ft.; abd.

Texas Gulf Prod. Co. No. 1 A. M. Perez, La Tinaja de Lara gr. Loc.

Kenedy County

Humble O. & R. Co. No. 1 Kenedy rnh., Penaseal gr. Drlg. sh. 4,986 ft.

Kleberg County

Pure Oil Co. No. 1 State, Tr. No. 155. T.D. 7,320 ft.; perf. csg. 7,235-47 ft.; rec. 270 ft. 42-gr. oil; I.P. 68 B.P.D.; 11/64-in. ck.

Lavaca County

H. L. Edwards et al No. 1 Frank Rather, M. Wooten Sur. Cg. sh. 4,753 ft.

Lee County

Fred Pederson et al No. 1 Brown, David Hudson Sur. T.D. 6,404 ft.; acd.; R.U.; pmpd. 100 bbls. fluid; 36 hrs.; 3 bbls. oily emulsion, bal. S.W.; dpnd. to T.D. 6,424 ft. fluid standing; 5,000 ft. S.W. and oil; P.O.P.; pmpg. at rate of 5 B. O. and 50 to 100 bbls. wtr. per day.

Live Oak County

Bruce Albright No. 1 Texas Joint Stock Ld. Bnk., J. Poitevent Sur. No. 197. Drlg. sh. 1,000 ft.

Harry Hotchkin No. 1 Wade, J. Sommers Sur. No. 147. T.D. 2,363 ft.; tstg.

L. W. Stieren No. 3 Lange, Thos. Adams Sur. T.D. 1,497 ft.

McMullen County

Holbrook and O'Farrell No. 1 Miles, J. Poitevent Sur. S.D. 1,003 ft.; tstg. sd. 968-75 ft.; showed wtr.; T.D. 1,514 ft.; S.D.

Mid-Western Pet. Corp. No. 1 C. E. Byrne, Geo. Pittuck Sur. R.U.

C. D. Scarborough and Biglane No. 1 Paul Foyt, James Garner Sur. No. 6. S.D. 1,228 ft.

R. M. Strum and Womack No. 1 Smith and Leischner, A. Zumwalt Sur. S.D. 1,358 ft.

Medina County

J. I. and J. W. Cromwell No. 1 Tschirhart, I. J. Rogers Sur. No. 18. Drlg. sd. 645 ft.

Gilcrease Oil Co. No. 1 W. S. Lilley, Abi Clark Sur. T.D. 3,219 ft.; abd.

Victor Ziegler No. 1 Paul Haby, Wm. G. Still Sur. No. 1. S.D. 930 ft.

Milam County

Alex Krause No. 1 Graves, Jackson Hall Sur. S.D. 900 ft.

Nueces County

H. D. & H. Oil Co. No. 1 Wright, V. L. De Herrera gr. S.D. 5,890 ft.

Heep Oil Corp. et al No. 1 G. W. Smith, Jose Vicente Lopez de Herrera gr. 10¾-in. csg. 1,090 ft.; T.D. 5,050 ft.; 7-in. csg. 5,049 ft.; perf. csg. 5,043-47 ft.; swbd.; no show; T.D. 6,501 ft.; abd.

Seaboard Oil Co. No. 8 Chapman, Laureles Farm Trs. (1 mi. S of Chapman field). T.D. 6,525 ft.; abd.

Shell Pet. Corp. No. 1 Griffith, Vicente Lopez de Herrera gr. Drlg. sh. 6,140 ft.

Refugio County

Morgan, Gulf Oil Corp. No. 1 B. D. Rooke, Aldrete 6¾ Lge. (La Rosa field. T.D. 5,714 ft.; W.O.C.; rec. 1,000 ft. P.L.O.; D.S.T. 5,709-14 ft.; T.D. 6,350 ft.; perf. csg. 5,850-55 ft.; flwg. gas and dist.; ⅛-in. ck.

Royal O. & G. Corp. et al No. 1 M. L. Oppenheimer, Antonio De la Vina Sur. (Bonnieview field.) R.U.

San Patricio County

Copano Oil Co. No. 4-C O'Connor, Timothy Hoyt Sur. Drlg. 4,627 ft.; (Mellon Creek).

Copano Oil Co. No. 5-C O'Connor, Timothy Hoyt Sur.; (Mellon Creek). Drlg. sh. 2,060 ft.

Culton et al No. 1 McCampbell, Peter Mahoney Sur. T.D. 7,270 ft.; abd.

Quintana Pet. Corp. No. 3-B O'Connor, Timothy Hoyt Sur., 5,800 ft. S of Mellon Creek field. R.U.

Smith O. Morgan No. 1 H., S. J. Pollan Sur. Drlg. sh. 3,812 ft.

Plymouth Oil Co. No. 1 Wilson, John Brown Sur. Drlg. sh. 6,610 ft.

Republic Nat. Gas Co. No. 1 Virginia Crockett. D. L. & Co. Sur. T.D. 5,525 ft.; abd.

Starr County

Banks Miller Oil Co. No. 2 Garcia, Juan Salinas Porc. No. 71. S.D. 665 ft.

Magnolia Pet. Co. No. 1 M. M. Garcia, S. Vela Porc. No. 90. Drlg. sh. 3,389 ft.

Rhinehart and Bowman No. 1 Bowman, J. C. McCarty Sur. Drk.

Rowan-Hope and Transwestern Oil Co No. 1 W. I. Cameron, Geo. W. Smith Sur. Loc. abd.

Sun Oil Co. No. 1 Olivarez. C.C.S.D.&R. G.N.G. Sur. T.D. 5,650 ft.; 7-in. csg. 5,330 ft.; tstg. sd. 4,101-26 ft.

Sun Oil Co. No. 3 Olivarez, C.C.S.D.&R. G.N.G. Sur. No. 239. Drlg. sh. 3,385 ft.

W. W. Zimmerman No. 2 M. S. Tijerina, H.E.&W.T.R.R. Sur. No. 299. Drlg. 750 ft.

Travis County

Oscar Raesz et al No. 1 J. W. Swahn, Phillips McElroy Sur. No. 16. S.D. 525 ft.

Webb County

Brazos Young Corp. No. 1 A. M. Bruni, J. Borego gr. T.D. 2,380 ft.

Gilcrease Oil Co. No. 1 W. E. Trafton, J. Poitevent Sur. No. 281. Drlg. 676 ft.

J. M. Hardie No. 1 J. M. Garcia, Blk. 27 of Hughes Pet. Co. Mineral subd., Los Ojuelos. Drlg. 1,330 ft.

A. E. Heniger No. 1 M. Guerra, Juan P. Yzaguirre Porc. No. 56. Drlg. 20 ft.

Johnson and Robinson No. 1 Mabel Adami, A.B.&M. Sur. No. 35. Drlg. 25 ft.

Smith & Storey No. 1 Houston Oil Co., R. O. Barnsley Sur. No. 24. Drlg. sh. 2,117 ft.

Willacy County

Cockburn et al No. 1 Yturria Ld. Livestock Co., San Juan de Carricitos gr. 10¾-in. csg. 1,228 ft.; cg. oil sd. 4,857-67 ft.; D.S.T. rec. 60 ft. oily mud; drlg. sh. 6,274 ft.

Zapata County

C. M. Lake et al No. 1 T. Vela, T.&N.O. Sur. No. 5. Drlg. 1,816 ft.

EAST TEXAS

(Border Counties)

Harrison County

Ark.-La. Gas Co. No. 1 Jim Davis, James Adams Sur. Drlg. L. 2,930 ft.

Long et al No. 1 Taylor, H. Martin Sur. Drlg. 3,285 ft.

Marion County—Rodessa

Cable Tool Drlg. Co. No. 1 Jackson, John Hanks Sur. Drlg. sh. 3,877 ft.

Gulf Oil Corp. No. 1 C. Ray, John Hanks Sur., NW cor. lse. 9⅝-in. csg. 1,910 ft.; drlg. sh.&L. 5,844 ft.

Harry Hanbury et al No. 2 Davis, Wm. R. Meyers Sur. 5½-in. csg. 5,975 ft.; Young sd. 5,979-87 ft.; T.D. 5,990 ft.; tstg.

Marion County—Other

Tom Bell No. 1 Moseley, D. Lane Sur. Fsg. for core bbl.

Exploroil Co., Inc., No. 1 Susie Chatten, I. N. Jones Sur. Nac. sd. 1,186-94 ft.; drlg. 2,533 ft.

Fitzwater et al No. 1 Terry, Gains Coor Sur. Drlg. 245 ft.

Van Horn & Clements No. 1 Berk, G. Coore Sur. S.D. 1,172 ft.

Shelby County

Neal & McDaniel No. 1 C. W. McDaniel, Wm. Snider Sur. Drlg. 3,949 ft.

Paul Pewitt No. 1 Rushing Est., Mannon Smith Sur. Drlg. 2,027 ft.

WEST TEXAS WILDCATS

Andrews County

Atlantic and Standard No. 1-B Cowden, Sec. 1, Blk. 14, T.&P. Sur. Shot 4,180 ft.; tstg.

J. W. Tripplehorn No. 1 M. A. Thornberry, Sec. 2, Blk. 42-A. S.D. 4,480 ft.

Borden County

Continental Oil No. 1 L. S. Monger, Sec. 38, Blk. 31, T.&P. Sur.; 4,000-ft. test. Drlg. 2,540 ft.

Brewster County

H. D. Wilcox No. 2 Kokernot, Sec. 23, Blk. C, J. V. Massey Sur. S.D. 225 ft.

Cochran County

T. G. Shaw, Tr., No. 1 Carrie S. Dean, Lge. 94. Swbg. 12 B.F.P.H., 4,981 ft.; swbg. and tstg. 4,982 ft.

Concho County

Clymore Co., Inc., No. 1 Hill, J. Frederick Sur. No. 1694. Drlg. 1,605 ft.

Crane County

Great Western Prod. No. 1-B Univ., Sec. 5, Blk. 30, Univ. Sur. W.O. pmp., 3,419 ft.; swbd. 127 B.O. in 12 hrs.; comp. 127 B.O.P.D.

Gulf Oil Corp. No. 5 M. B. McKnight, Sec. 1, Blk. 21-B, P.S.L. Sur. Drlg. 2,115 ft.

Magnolia Pet. Co. No. 12 W. P. Edwards, Sec. 12, Blk. 23-B, P.S.L. Sur. Drlg. 3,526 ft.; 1,000 ft. O.I.H.

Crockett County

Hanson & Anderson No. 1 W. T. Knoelke, Sec. 30, Blk. GG, H.E.&W.T. Sur. Spd. and S.D.

Humble No. 1 Ozona-Barnhart, Sec. 4, Blk. M-N, G.S.&F. Sur. Drlg. 5,411 ft.

Culberson County

Harry Niehaus No. 1 Caldwell, Blk. 109, Sec. 13, P.S.L. Sur. Drlg. 4,759 ft.

Quito Oil Co. No. 1 Cameron Lbr. Co., Sec. 24, Blk. 81, P.S.L. Sur. S.D.R. 945 ft.

Dawson County

Daw-Tex Oil No. 1 J. E. Neely, Sec. 28, Blk. 35, T.&P. Sur. Prep. cmt. 7-in. 4,369 ft.; pulling collapsed 7-in. at 4,450 ft.; W.O.C. 3,751 ft.; cmt. whipstock; drlg. by whipstock.

Dickens County

Bond D. Jones No. 1 Ford et al, I.&G.N. Sur. Bailing; prep. D.D.

Humble O. & R. Co. No. 1 Matador Ld. & Cattle Co., Sec. 26, Blk. 1, Shock & Arnold Sur.; 6,000-ft. test. Drlg. 6,630 ft.

Ector County

M. B. K. Drlg. Co. No. 2 Gist, Sec. 9, Blk. 42, T.&P. Sur. Drlg. 942 ft.

R. R. Rhodes No. 1 J. L. Johnson, Sec. 43, Blk. 42, T.&P. Sur. Flwg. by hds. 4,250 ft.

Sinclair Prairie No. 1 Fay Holt, Sec. 1, Blk. A, P.S.L. Sur. Heading oil 4,217 ft.

El Paso County

Tri-State Oil Co. No. 1 Kinkel. S.D. 3,571 ft.

Gaines County

Osage Drlg. Co. No. 1 E. H. Jones, Sec. 20, Blk. 7-A, P.S.L. Sur. R.U.R.

Garza County

Gulf Oil Corp. No. 1 Swanson, Sec. 25, Blk. 2, H.&G.N. Sur. Flwd. 148 B.O. in 9 hrs.; P.B. depth of 7,400 ft.; P.B. 6,821 ft.; tstd. S.W.; P.B. 6,134 ft.; tstg.; drld. out to 6,857 ft.; P.B. 6,296 ft.; swbg and tstg.

Glasscock County

B. A. Duffy No. 1 Carter-Shell, Sec. 8, Blk. 33, T.&P. Sur. Drlg. 1,851 ft.

J. R. Petty No. 1 Joe Blake, Sec. 163, Blk. 29, W.&N.W. Sur. S.D. 640 ft.

Hockley County

S. W. Richardson No. 1 A. E. Coe Lbr. 53, Lge. 40, Maverick C.S.L. Sur. Cd. several zones of sat.; P.B. 5,143 ft.; tstg. wtr. shutoff; flwd. 12 B.P.H.; P.B. 4,982 ft.; flwd. 15 B.O.P.H.; comp. 2,048 B.O.P.D.

Texas Co. No. 1-C Mallett, Lbr. 11, Lge. 51, Scurry C.S.L. Sur. Drlg. 400 ft.

Howard County

A. Delcambre, Jr., No. 1 M. H. O'Daniels, Sec. 39, Blk. 30, T.&P. Sur. Loc.

Dick Graham No. 1 P. Johnson, Sec. 34, Blk. 32, T.&P. Sur. Loc.

Ooley & McQuain No. 1 O'Daniels, Sec. 39, Blk. 30, T.&P. Sur. Drlg. 300 ft.

T. G. Shaw, Tr., No. 1-B Wilkerson, Sec. 19, Blk. 34, T.&P. Sur. Sul. wtr. 3,448 ft.; prep. D.D.

Hudspeth County

Haymon Kroupp Oil & Ld. Co. No. 1 Thaxton, SE¼ Sec. 34, Blk. 74, Twp. 6. Drlg. 5,994 ft.

Haymon Krupp No. 1 Briggs, Sec. 24, Blk. 73, Twp. 7, T.&P. Sur. W.O.C. 5,365 ft.

Irion County

J. W. Ellis No. 1 Sol Mayer, Sec. 240; Blk. 1, T.&P. Sur.; 2,100-ft. test. Lost hole, skidded 10 ft. east. Drlg. 1,600 ft.

Lynn County

John L. Baldridge No. 1 Alma Lbr. Co., Sec. 151, H.E.&W.T. Sur. W.O.C. 4,450 ft.

Martin County

T. G. Shaw, Tr., No. 1 Wilkerson, Sec. 35-A, B.&C. Sur. S.D. 3,785 ft.

Pecos County

Geo. T. Abell No. 1 W. Williams, Sec. 11, Blk. 3, H.&T.C. Sur. Drlg. 2,465 ft.

Ben Dansby No. 1 L. C. Lessenich, Sec. 45, Blk. 9, H.&G.N. Sur. S.D.R. 1,136 ft.

Leidecker & Cain No. 1 M. M. Lehn, Sec. 71, Blk. 10, H.&G.N. Sur. Drlg. 255 ft.

O. E. Schade No. 1 Otis Garrett, Sec. 59½, Blk. 8, H.&G.N. Sur. Drlg. 2,154 ft.

Thomason Prod. Co. No. 1 Notions, Sec. 1, Blk. 105, W. P. Howard Sur. Prep. D.D. 1,772 ft.

S. Thompson No. 1 Elsinore Cattle Co., Sec. 54, Blk. D, G.C.&S.F. Sur. Rig burned; dropped bailer in hole; S.D.O. 7,342 ft.

J. C. Trees No. 1 fee, Sec. 63, Blk. 3, H.&G.N. Sur. Fsg. 2,295 ft.

Reeves County

Artie Baker No. 1 J. W. Grider, Sec. 31. Blk. 58, P.S.L. Sur. S.D.R. 450 ft.

Schleicher County

Lone Star Gas Co. No. 1 Bert Page, Sec 30, Blk. L, G.H.&S.A. Sur. Fsg. 4,750 ft.

Lone Star Gasoline Co. No. 2 Bert Page Sec. 46, Blk. L, G.H.&S.A. Sur. Drlg. 2,378 ft.

Scurry County

Coffield & Guthrie No. 1 First Natl. Bk., Snyder, Sec. 29, Blk. 97, H.&T.C. Sur. Drlg. 2,995 ft.

Tom Green County

Dan Short et al No. 1 J. G. Davidson, NW part of Lovie P. Moore Sur. Loc.

Southern Cross No. 1 Upton & Upton, Sec. 20, Blk. A, A.B.&M. Sur. Straightening hole 1,420 ft.

Spinner No. 1 Reed, Mason Ferry Ranch Sur. Drlg. 5,335 ft.

Tom Green Oil Co. No. 1 Schreiber, A. Krending Sur. No. 1663. Drlg. 1,590 ft.

Upton County

White & Wilson No. 1 Webb, Sec. 176 Blk. 1, C.C.S.D.&R.G.N.G. Sur. Drlg. 2,240 ft.

Ward County

McQueen & Clevenger No. 1 Geo. Sealy, Sec. 47, Blk. F, G.M.M.B.&A. Sur. Drlg. 575 ft.

Geo. Wallace No. 1 R. Avery, Sec. 36, Blk. 1, H.&T.C. Sur. Loc.

Winkler County

Standard Oil, Texas, No. 2 Baird, Sec. 13, Blk. 3-B, P.S.L. Sur. Drlg. 3,352 ft.; S.O. 3,343 ft.

Yoakum County

Osage Drlg. Co. No. 1 Miller, Sec. 898, Gibson Sur. Tstg. 5,106 ft.

Shell Pet. Corp. No. 1 J. M. Rutts, Sec. 743. P.B. 5,229 ft.; comp. 161 B.O.P.D.

Shell Pet. No. 1 Waples-Platter, Sec. 616. Waiting on cable tools 5,000 ft.

T. & P. Oil Co. No. 1 A. M. Brownfield, Sec. 802. Tstg. 5,151 ft.

TEXAS PANHANDLE

Collingsworth County

C. H. Mee and C. F. Anderson No. 1 V K. McCaskill, Sec. 18, Blk. 16, H.&G. N. Sur. Drlg. 1,960 ft.
Johnson No. 1 Taylor. S.D. 875 ft.

Deaf Smith County

Uscan No. 1 Farwell. S.D. 5,650 ft.

Donley County

Robinson No. 1 Kuteman, Sec. 88, Blk 20, H.&G.N. Sur. S.D. 4,406 ft.

Gray County

Products O. & G. Co. No. 1 Mason Davis, Sec. 23, Blk. 23-M, H.&G.N. Sur. Loc.
Trippiehorn No. 2 Webb, Sec. 12, Blk. A-9, H.&G.N. Sur. Cl. out 2,665 ft.; installing pump.

Lipscomb County

Darrouzett Oil Co. No. 1 Pugh, 1½ mi. S and 1 mi. W of Darrouzette. S.D.; wtr. 3,401 ft.

Roberts County

Whitlock No. 1 Cunningham. Drlg. 4,180 ft.

E. C. TEXAS WILDCATS

Angelina County

K. L. McHenry No. 1 J. S. Russell, A. Flores Sur., 4 mi. N of Lufkin. Drlg. 55 ft.

Cherokee County

C. C. Lanier No. 1 A. T. O'Neal, J. M Procella Sur., 3 mi. E of Troup. S.D. 3,600 ft.

Falls County

M. A. Hayes No. 1 D. G. Wooten, J. Powell Sur., 8 mi. SE of Lott. R.U. & S.D.
Marshall Hayes No. 1 M. Murphy, J. M. Sanches Sur., 2 mi. NE of Lott. Comp. 33 B.O.P.D.

Freestone County

Jack Frazier No. 1 F. Marberry, 1½ mi. NE of Kirvin. Drlg. 3,400 ft.

Grayson County

John Grey No. 1 Freedman, W. S Reeves Sur., 8 mi. NW Denison. S.D. 100 ft.
Jim McMurrey No. 1 Dr. T. J. Long, J Garland Sur., 2 mi. S of Collinsville 4,000-ft. test. S.D.O. 3,929 ft.
Ross & Marshall No. 1 J. N. Taylor, W Moore Sur., 8½ mi. NW of Denison. Drlg. 856 ft.

Houston County

Cities Service Oil No. 1 C. C. Hill, J. D. Procella Sur., 2 mi. W of Grapeland. Loc.
Leggett & Gossett No. 1 B. F. Gardner J. Thorn Sur., just N of Weldon. D.&A. 2,200 ft.

Kaufman County

Sam Knoerr No. 1 J. B. Hunter, P Walker Sur., 5 mi. S of Terrell. S.D. 40 ft.
W. G. McGee No. 1 General American Life Ins. Co., John Baker Sur., 6 mi. W of Mabank. Drk.

Leon County

Humble O. & R. Co. No. 1 Ed F. Swift, H. W. Subblett Sur., 4 mi. NW of Navarro Crossing field. Drlg. 5,160 ft.

Limestone County

H. Gant No. 1 Vol De Long, P. Varela Sur., 1½ mi. NW of Thelma. W.O.C. 2,983 ft.
H. Richardson No. 1 Banks, B. Davis Sur., 2 mi. NE of Thornton. Drlg. plug 60 ft.
S. A. Thompson No. 1 R. L. Nance, J. D. Brown Sur., 5 mi. SE of Thornton. Drlg. 1,170 ft.

McLennan County

C. E. Porter No. 1 B. D. Burchett, De la Vega Sur., just SE Waco. S.D. 695 ft

Navarro County

Guy Sitton No. 1 J. P. Fortson, T. J. Chambers Sur., 4 mi. E of Alma. S.D. 628 ft.

Rains County

McKinley & Hastings No. 1 McTaggert B. Milder Sur., 1 mi. W of Emory. S.D. 720 ft.

Red River County

Bentley-Sheppard & Stevens No. 1 So Pine Lbr. Co., G. S. Parks Sur., 17 mi. N of Clarksville. Cg. 1,777 ft.
Daniels No. 1 J. J. Gaston, Joseph Guest Sur., 2 mi. S. Detroit. Formerly abd. at 1,109 ft. Drlg. 1,274 ft.
Hampton, Osteen & Wooley No. 1 J. M. Roberts, J. Ware Sur., 12 mi. N of Clarksville. Loc.

Smith County

R. W. Rair No. 1 Clark, J. Lewis Sur., 2 mi. W Mt. Sylvan. Drlg. 4,923 ft.
J. H. Thomason No. 1 J. W. Bartlett, R H. Stewart Sur., ½ mi. SE of Jamestown. S.D. 2,050 ft.

Trinity County

C. D. Davis No. 1 J. D. Gibson, A. Donavan Sur., 4 mi. NE of Trinity. Gas blowout 148 ft.; D.&A. at 2,630 ft.

Upshur County

Gaskill Oil No. 1 E. E. Arnold, J. Scott Sur., 2 mi. SE of Jamestown. Loc.
R. E. L. Johnson No. 1 Lizzie Parker, John B. Gay Sur. S.D. 4,004 ft.

Van Zandt County

F. A. Richardson No. 1-A B. C. Dodd, T. W. Hutchinson Sur., 2 mi. S of Grand Saline. S.D. 1,925 ft.

Wood County

Geo. Strake No. 1 Farrier, J. Walker Sur., 4 mi. E of Yantis. Drlg. 5,215 ft.

NORTH TEXAS WILDCATS

Archer County

British American O. P. Co. No. 1 T. B. Wilson, Sec. 12, H.&T.C. Sur. Matrl.
E. P. Griffin No. 1 W. T. Waggoner, Sec. 3, H.&T.C. Sur. O.S. 4,393-4,407 ft.; 6⅝-in. 4,388 ft.; comp. 744 B.O. P.D.
Phillips Pet Co. No. 1 J. B. Miller, Sec. 20, A.T.N.C.L. Sur. T.D. 4,006 ft.; O. W.D.D.; S.O. to D.D. to 4,500 ft.; C.O. 3,800 ft.
Shell Pet. Corp. No. 1 Bell Co. Sch. Lds., Blk. 47, Abst. 12. Loc.
L. Sikes No. 1 Miller, Wm. Shaw Sur. A-378. Fsg. 5,790 ft.

Baylor County

British Am. O. P. Co. No. 1 J. E. Cope. Sec. 220, T.&N.O. Sur. S.D.R. 4,040 ft.

Clay County

L. T. Burns No. 1 Browning, Sec. 94, Belcher subd.; 5,000-ft. test. 6⅝-in. 4,437 ft.; S.S.O. 4,435-45 ft.; comp. 1,248 B.O.P.D.
H. S. Moss No. 1 T. J. Parmley, Sec. 6s. M.G.S.L. Sur. A-308. Drlg. 2,934 ft.

Hardeman County

N. Gilbert No. 1 R. Weakley, Sec. 85, H. &T.C. Sur., 4,000-ft. test. Loc.

Cooke County

Mean & Howard No. 1 W. T. Lynch, A. Edmiston Sur. A-353. Matl. for 5,000-ft. test. R.U.R.
Needham & Richards No. 1 Peary, T. Toby Sur. A-1047. Drlg. 819 ft.

Jack County

Buttram Pet. Corp. No. 1 Cullers, Blk. 4, S.P.R.R. Sur. Drlg. 700 ft.
Pitzer & West No. 1 F. Warren, Sec. 2784, T.E.&L. Sur. 6⅝ 4,365 ft.; L. 4,365-4,418 ft.; tstg. est. 150 bbls.

Montague County

Benton & Holmes No. 1 J. Bowers, Sec. 55, M.E.P.&P. Sur. S.S.O. 2,887-95 ft.; 6⅝-in. 2,883 ft.; tstg. est. 500 to 600 B.P.D.
Cordova-Union Oil-Gillespie No. 1 Cable, Stephenson Sur., Abst. 462. Loc.
Staley Oil Co. No. 1 Nunnely, M. S. Ussery Sur. A-824. Spdg.

Wichita County

F. S. Freeland No. 1 J. D. Cooper, H. Hastie A-92; 4,000-ft. test. Spd. and S.D.

Wise County

H. Jackson No. 1 F. Neeley, Blk. 29, Matagorda Co. Sch. Ld. Spd. and S.D.
H. M. Muse No. 1 F. F. Kaker, Blk. 16, Matagorda Co. Sch. Lds. Plts.

Wilbarger County

Lawson & Leavell No. 16 W. T. Waggoner A, Sec. 109, H.&T.C. Sur., Blk. 14; 3,500-ft. test. Drlg. 416 ft.

Young County

H. M. Leidecker No. 1 J. M. Nall, Sec. 1997, T.E.&L. Sur. Drlg. 2,610 ft.
Long & Lupton No. 1 A. Crouch, I.&G. N. Sur. A-1460. 6⅝-in. 3,865 ft.; sat. L. 3,940-44 ft.; treating with acid; test wtr.; S.D.O.

WEST CENTRAL TEXAS DISTRICT

Brown County

E. C. Norman No. 1 Stella Rice, Chas. Messenger Sur. No. 127. P.B. 985 ft.; tstg.
A. D. Bruce No. 1 L. J. Mauldin, Sec. 15, H.&T.C. Sur. S.D.R. 480 ft.

Callahan County

Dobbs Oil Co. No. 1 Finley, Sec. 75, Bayland Orphans Home Ld. Skidded over to start new hole.
J. C. Jackson and Doug. Tomlingson, Jr. No. 1 T. J. Thompson, Sec. 30, B.B.B &C. Sur. S.D. 1,886 ft.
Pet. Prod. No. 1 J. M. Morrisset, SW¼ Sec. 91, Blk. 13, T.&P. Sur., 5 mi. NW of Clyde. Loc.
Westgate-Greenland Oil Co. No. 1 Chas. Yost, SE¼ Sec. 23, Blk. 8, S.P.R.R. Sur., on Callahan-Taylor County line. Loc.

Coleman County

E. E. Kirkpatrick No. 1 F. Nixon, Burnett, C.S.L. Sur. S.D. 3,027 ft.; may plug 3,027 ft.

Comanche County

Comanche O. & G. Co. No. 1 J. E. McGuire, C. Rockefeller Sur. No. 3. Fsg. 2,910 ft.
E. T. DeArman No. 1 Moorman, Sec. 37, D.&D.A. Sur. Fsg. 2,600 ft.

Eastland County

Dobbs Oil Co. No. 1 Greer, J. E. Hardy Sur., Ellenburger test. S.D. wtr. 2,213 ft.

Erath County

Wayne Chandler No. 1 Chandler, J. W. Moore Sur., Abst. 571, S.D.R. 4,151 ft.
Collard No. 1 W. L. Payton, H. Pierson Sur. No. 1, Abst. 1105. Temp. abd. 185 ft.

Fisher County

J. D. Baker No. 1 O. R. Burnham, Sec. 4, Blk. R, W. D. Richardson Sur. S.D. O. 3,214 ft.

Hamilton County

Wallace & Vickers No. 1 C. C. Lund, J. P. Bailey Sur. 51. S.D.O. 2,640 ft.

Hood County

Prince & Miller No. 1 J. H. Andrews, NW cor. of Geo. Sutherland Sur. S.D.O.; P.B. depth of 524 ft.

Jones County

Brown Eagle No. 1 Waterson, Andrews Sur. No. 191, T.D. 2,283 ft.; S.D.
R. B. Carrol No. 1 G. Herndon, Goliad C.S.L. Sur. S.D.O. after acid failed 2,677 ft.
Ed. L. Evans No. 1 B. J. Crier, Sec. 8, B.A.L. Sur. Swedging casing 1,715 ft.
G. M. Gillispie No. 1, Sec. 54, O.A.L. Sur. Drlg. 2,180 ft.
S. C. Herring No. 1 Guitar Est., western part of F. Sieverman Sur. No. 12. Loc.

Nolan County

Chas. E. Peddicord No. 1 Tipton, Sec. 43, Blk. 19, T.&P. Sur. S.D.R. 3,670 ft.

Palo Pinto County

W. K. Gordon No. 1 J. W. Conway, Ruldosa I.R.R. Sur. Drlg. 3,360 ft.

Parker County

Brown-Gardner Bros. No. 1 Gilbert, T.& P. Sur., Abst. 1958. S.D. 2,200 ft.

Shackelford County

Fox & Rudd No. 1 Shotwell, Sec. 59, B.A.L. Sur. Fsg. 1,632 ft.
R. H. Gordon and Frank Pethybridge No. 1 C. B. Synder, 330 ft. fr. N and E lines, Sec. 38, L.A.L. Sur.; 4,500-ft. test. Est. 20 to 50 B.O.P.D.; T.D. 3,660 ft.; S.D. 4,293 ft.
C. W. Waddington No. 1 Cottle, Sec. 42, Univ. Sur. S.P. and S.D.

NEBRASKA

Pawnee County

Blazer & McClure et al No. 1 Allen, NW NE SW Sec. 16-1n-10e. Bart. sd. 40 ft.; Miss. L. 149 ft.; Arb. 789 ft.; T.D. 801 ft.; lost hole and shot off csg.; P.B. to 450 ft.; 100 gal. acd. and 1,000 gal. acd.; C.O.

Richardson County

H. C. Stephens and E. Uhri No. 1 Harlow, C SE NE Sec. 32-1n-13e. O.W.D. D.; S.D. 780 ft.

Hitchcock County

C. L. Price No. 1 Carter, SE NE SW Sec. 35-2n-32w. Drlg. 3,150 ft.

FLORIDA

Nassau County

St. Mary Oil Corp. No. 1 Hillard, Sec. 19-4n-24e. Set 6⅝-in. csg. 3,935 ft.; fsg. D.S. 4,575 ft.

Lake County

Union O. & R. Co. No. 1 Gulf Expln., Sec. 17-24s-25e. S.D. 235 ft.

ALABAMA

Barbour County

H. A. Stebbinger et al No. 1 Mrs. Alyce Robertson, C NE NE Sec. 19-10n-25e. S.D. 4,950 ft.; set 7-in. csg. 4,500 ft.; will run 450 ft. 4¾-in. perf. lnr. to bttm. to test; reported 300 ft. asphaltic sd.&sh.

Canadian Fields

(Continued from Page 138)

drill three wells on acreage secured from Home Oil Co. in North Turner Valley; and it is expected three new wells will be drilled by independent companies. Turner Valley costs are based on an average of $165,000 a well.

Outside Turner Valley some 28 wildcat tests are listed as active, though some will not resume drilling till the weather moderates. The costs of such wells may vary from $25,000 to as much as $400,000, depending on drilling conditions, though $100,000 is regarded as a fair average. The estimate for wildcat drilling does not allow for the prospect of intensive activity should a new field be opened early in the year.

Turner Valley drilling now under way or in prospect is expected to materially increase the field potential, now estimated around 60,000 bbls. a day, with a restricted quota around 10,000 bbls. Should this increased potential be supplemented by large new developments in other areas, pipe line facilities are likely to be provided.

Rocky Mountain Runs

Production estimates for week ended March 18:

WYOMING

	Bbls.
Salt Creek	14,840
Big Muddy	1,260
Badger Basin	180
Cody dome	70
Cole Creek	110
Dallas Derby	350
Dewey dome	10
Dutton Creek	40
Elk Basin	580
Frannie	400
Garland	1,830
Grass Creek	1,870
Hidden dome	90
Hudson	230
LaBarge	810
Lance Creek	13,140
Lost Soldier	1,700
Mahoney	220
Medicine Bow	2,220
Mule Creek	200
Midway	20
Oregon Basin	1,890
Osage	750
Quealy dome	760
Rex Lake	10
Rock River	3,000
Spindletop	40
Poison Spider	270
Teapot	10
Warm Springs	120
Wertz	1,390
Total Wyoming	48,410

MONTANA

Border	150
Cat Creek	580
Cut Bank	8,230
Dry Creek	1,180
Kevin-Sunburst	3,490
Lake Basin	20
Pondera	690
Total Montana	14,340

COLORADO

Florence	210
Fort Collins and Wellington	320
Wilson Creek	350
Iles dome	2,050
Moffat	290
Orchard	30
Rangely	20
Tow Creek	150
Price	470
Total Colorado	3,890

NEW MEXICO

Cooper	4,530
Eaves	870
West Eunice	110
Eunice	24,640
Hardy	3,310
Hobbs	13,110
Jal	930
Langlie	5,260
Lynch	550
Lynn	860
Mattix	4,020
Monument	25,390
North Lynch	40
Penrose	6,060
Rhoades	130
Skaggs	100
Skelly	2,110
South Eunice	3,590
South Lovington	160
Vacuum	8,710
Artesia-Maljamar	9,090
Getty	100
Hogback	200
Rattlesnake	580
Table Mesa	80
Total New Mexico	114,530
Total Rocky Mountain region	181,170

STOCKS HELD IN PACIFIC COAST TERRITORY BY CALIFORNIA OIL COMPANIES

	Jan. 31, 1939	Dec. 31, 1938 (Reclassified)	January changes
1 Gasoline-bearing crude	36,831,079	*36,225,312	+ 605,767
2 Nongasoline-bearing crude	16,355,501	16,282,177	+ 73,324
3 Unblended natural gasoline	2,536,877	2,699,455	— 162,578
4 Gasoline (not including distributing and service stations)	14,265,941	13,259,369	+ 1,006,572
5 Naphtha distillates	†1,669,331	†1,566,349	+ 102,982
6 Gas oil and diesel oil	10,689,438	10,539,937	+ 149,501
7 Fuel oil residuum	71,245,092	70,957,881	+ 287,211
8 All other stocks	6,338,218	6,153,809	+ 184,409
Total	159,931,477	*157,684,289	+ 2,247,188
†Estimated amount of unfinished gasoline contained in item No. 5	1,408,777	1,350,379	

*Revised.

Kansas Fields

(Continued from Page 129)

Brewer No. 1 Sherwood, SW NW NW Section 27-31-4e, was moving in material.

In Rooks County, Vickers Petroleum Co. No. 4 Luhman, C W half W half SE Section 11-9-16w, was a cellar.

In Sumner County, Champlin Refining Co. No. 6 Lane, NW NW SW Section 9-30-2w, was drilling below 1,850 feet.

In Barber County, Barbara Oil Co. No. 1-C Thompson, C SW Section 16-33-13w, was rigging up rotary.

Gulf Coast Fields

(Continued from Page 120)

inson field: Mar-Tex Oil Corp. No. 1 Maggie P. Lowber, top sand 8,715 feet, 538 bbls., quarter-inch choke.

Chambers County

Seabreeze field Sun Oil Co. No. 2 R. J. Barrow, sand 8,473-80 feet, 195 bbls., eighth-inch choke.

Harris County

Eureka field: J. W. Frazier No. 1 Sandy Acres subdivision, perforated casing 7,684-98 feet, 634 bbls., quarter-inch choke. Fairbanks field: E. M. Hailey No. 2 Albert Brown, perforated casing 5,837-38 feet, 132 bbls., eighth-inch choke. Housh & Thompson No. 1 R. E. Abraham, perforated casing 6,846-50 feet, 157 bbls., eighth-inch choke. Union Producing Co. No. 3 White-Head-Rash and others, 6,856 feet, 143 bbls., eighth-inch choke. Friendswood field: Humble Oil & Refining Co. No. 17-B Humble-West, sand 5,993-6,040 feet, 427 bbls., quarter-inch choke. Satsuma field: H. E. Williams and others No. 1 Behne, perforated casing 6,853-59 feet, 382 bbls., quarter-inch choke. Tomball field: Humble Oil & Refining Co. No. 4 Doege, 5,567 feet, 297 bbls., quarter-inch choke.

Jefferson County

Lovells Lake field: George Echols No. 1 Beaumont Launch Club, 7,750 feet, abandoned. Spindletop field: Stanolind Oil & Gas Co. No. 152 McFaddin, perforated casing 3,295-85 feet, 66 bbls., quarter-inch choke.

Liberty County

Hardin field: Shell Petroleum Corp. No. 2-B West, 7,633 feet, 459 bbls., quarter-inch choke.

Jackson County

Cordele field: H. J. Porter No. 1 S. G. Drushel, broken sand 2,679-81 feet, 315 bbls., quarter-inch choke.

Wharton County

Withers field: Smith & McDannald No. 1 Baker, 5,548 feet, 104 bbls., eighth-inch choke. Smith & McDannald No. 1 Broussard-Stovall, 5,547 feet, 82 bbls., eighth-inch choke.

Polk County

Segno field: Gulf Oil Corp. No. 6-B Quinn, 5,281 feet, abandoned. Gulf Oil Corp. No. 6 Ragan, sand 8,060-70 feet, 611 bbls., quarter-inch choke.

Chambers County

Anahuac field: Gulf Oil Corp. No. 5 D. W. Syphrett, sand 7,148-57 feet, 690 bbls., quarter-inch choke. Humble Oil & Refining Co. No. 7 Wilcox, sand 7,082-95 feet, 250 bbls., quarter-inch choke.

Orange County

Port Neches field: Texas Co. No. 13 H. J. Kuhn, sand 5,833-5,975 feet, 183 bbls., five-sixteenths inch choke.

Ohio Fields

(Continued from Page 116)

No. 42 William Ripley, Lot 2, made 4 bbls. of oil the first 24 hours after shot from the Berea at 390-485 feet.

Monroe County, Summit Township, J. E. Lumbatis and others No. 1 Etta Baker, Section 5, gauged 100,000 cu. ft. of gas, open flow, from the Berea sand at 1,902-12 feet.

Noble County, Beaver Township, Barnesville Development Co. No. 1 W. H. Timmons, Section 18, was completed as a small Berea sand gas well; total depth 1,650 feet.

Perry County, Madison Township, Atha C. No. 1 Mable Wilkins, Section 17, produced 50 bbls. of oil the first day without a shot; Clinton sand at 3,168-70 feet. Monroe Township, Kachelmacher estate completed two Clinton sand oil wells. No. 2 E. H. Davis, Section 30, made 125 bbls. the first 24 hours after shot in sand at 3,608-50 feet. No. 20 Hemlock Coal Co., Section 30, was shot and is making 5 bbls. of oil a day from sand at 3,614-53 feet.

Lima Field

The sub-Trenton test 8 miles south of Xenia in Caesar's Creek Township, Green County, proved to be a failure. D. R. Buchanan and others drilled No. 1 Steele Progue, in Lot 1044, to a depth of 1,576 feet without any commercial showings; Trenton, 1,050-1,512 feet; Green shale, 1,512-37 feet, with water at 1,527 feet; sandy lime, 1,537-75 feet.

Benedum-Trees Oil Co. is drilling at 1,100 feet on a wildcat 3 miles east of the Ohio-Indiana state line in Preble County, Jackson Township, Section 9, on the John Morrow tract.

In Brown County, Perry Township, Col. J. P. Kappas No. 1 George Moore is drilling at 400 feet in the Trenton.

In Wood County, Portage Township, Goodwill Oil & Gas Co. No. 1 Lester Shinew, Section 5, has set casing at 1,869 feet but as yet has not deepened the hole.

In Henry County, Harrison Township, Section 24, McAfee and others are having difficulty in running casing in the Lucy Damon test; 1,800 feet have been run at the present writing.

Wildcat Drilling in 1938

(Continued from Page 46)

creasing proportion of producers to dry holes in total number of wildcats drilled; (2) reduction of number of feet drilled in dry holes for every foot drilled in producers, in spite of increasing average depth per hole; (3) increasing success of the discovery of new pools, and (4) maintenance of the 3 to 1 factor of success in technical locations as contrasted with nontechnical locations. These are fine accomplishments, but what do they mean and whither do they lead in the larger picture of oil exploration and development?

The three main incentives for wildcatting are the lure of pioneering, the urge to augment reserves, and the pressure caused by approaching termination of leasehold interests. To what extent has each of these incentives controlled the campaign of wildcatting? To what extent will each, individually and relatively, control future wildcatting? What may be the effects of continued discovery of many new pools through a period of several years? These are important questions which may well be considered in relation to certain major problems of oil-field development.

More Oil Burner Shipments Than a Year Ago

NEW YORK, Mar. 21.—Shipments of oil burners by 178 manufacturers amounted to 8,738 units in January, compared with 8,824 in December and 6,338 in January 1938, it was reported last week by the Bureau of the Census, Department of Commerce.

Stocks at the end of the month totaled 21,885, compared with 21,326 in December and 24,927 in January 1938. Unfilled orders at the end of the month were 3,033, compared with 2,155 at the end of December and 2,090 at the close of January 1938.

Alberta Oil Revenue

EDMONTON, Alberta.—Revenue of the Alberta government from the oil industry, including rentals, royalties, and other sources, totaled approximately $900,000 in the fiscal year 1938-39. Administration costs represented 4.4 per cent of revenue.

STANDARD OIL CO. OF CALIFORNIA AND UNION OIL CO.

Crude oil prices at the well effective June 22, 1936

Gravity—	Signal Hill (Long Beach)	Seal Beach	Alamitos Heights	Huntington Beach	Inglewood	Playa del Rey	Olinda-Brea Canyon	Athens-Rosecrans	Dominguez	Ellwood Terrace	Torrance	Richfield	Whittier E. Coyote (La Habra)	Montebello	W. Coyote Hills	Santa Fe Springs	Mountain View	Elk Hills Buena Vista Hills Midway-Sunset Lakeview Area	Lost Hills	Coalinga	Santa Paula*	Wheeler Ridge	Kettleman Hills	Orcutt*
14-14.9	$.80	$.79	$.74	$.78	$.79	$.80	$.76	...	...	...	$.80	$.76	$.76	$.77	$.78	...	...	$.70	$.70	$.70	...	...	$.70	...
15-15.9	.80	.79	.74	.78	.79	.80	.76	...	...	...	.80	.76	.76	.77	.78	...	...	.70	.70	.70	...	...	.70	...
16-16.9	.80	.79	.74	.78	.79	.80	.76	...	...	...	.80	.76	.76	.77	.78	...	...	.70	.70	.70	...	...	.70	$.70
17-17.9	.80	.79	.74	.78	.81	.80	.76	...	...	...	.80	.76	.76	.77	.78	...	...	.70	.70	.70	...	...	.71	.70
18-18.9	.80	.79	.74	.78	.84	.80	.78	...	...	...	.82	.76	.76	.77	.78	...	...	.70	.70	.70	...	...	.73	.72
19-19.9	.82	.79	.74	.82	.87	.84	.81	...	...	...	.85	.76	.78	.77	.78	...	$.70	.74	.74	.71	$.70	...	.75	.74
20-20.9	.85	.79	.74	.85	.90	.88	.84	...	...	...	.88	.78	.82	.77	.80	...	.70	.78	.78	.72	.70	...	.77	.77
21-21.9	.88	.79	.74	.89	.93	.93	.88	...	...	...	.91	.80	.85	.77	.84	$.78	.73	.82	.82	.74	.70	...	.79	.80
22-22.9	.92	.82	.74	.92	.96	.98	.92	...	...	...	.93	.84	.89	.79	.88	.78	.77	.87	.86	.78	.72	...	.82	.83
23-23.9	.95	.86	.77	.96	.99	1.02	.96	$.84	$.79	...	.96	.88	.93	.82	.92	.78	.80	.92	.90	.82	.76	...	.85	.86
24-24.9	.99	.91	.80	1.00	1.02	1.06	.99	.88	.81	...	.99	.91	.96	.85	.96	.82	.84	.97	.94	.86	.79	...	.87	.88
25-25.9	1.03	.95	.82	1.03	1.05	1.11	1.03	.93	.83	...	1.02	.95	...	.89	.99	.86	.88	1.01	.98	.90	.88	...	.90	.91
26-26.9	1.06	1.00	.85	1.07	1.09	1.16	1.06	.98	.86	...	1.05	.98	...	.92	1.03	.90	.91	1.06	1.02	...	...	...	.92	.93
27-27.9	1.10	1.05	.88	1.11	1.12	...	1.10	1.03	.88	...	...	1.02	...	.96	1.06	.95	.95	1.10	1.06	...	...	...	.95	...
28-28.9	1.14	1.10	.90	1.14	1.15	...	1.14	1.07	.90	...	...	1.06	...	.99	1.10	.99	.99	1.15	1.10	...	...	...	.97	...
29-29.9	1.17	1.15	.93	1.18	1.18	F.O.B.	1.17	1.12	.93	...	...	1.09	...	1.03	1.14	1.03	1.02	1.20	1.14	...	...	...	.99	...
30-30.9	1.21	1.19	.95	1.22	1.21	our	1.21	1.17	.95	F.O.B.	...	...	...	1.07	1.17	1.08	1.06	1.25	1.18	...	...	...	1.01	...
31-31.9	...	...	...	...	1.24	Pipe	1.24	1.22	.97	Ship	...	...	...	1.11	1.21	1.12	1.09	1.29	...	...	...	...	...	...
32-32.9	...	...	...	...	1.27	Line	1.27	1.27	1.00	...	...	...	...	1.14	1.25	1.16	1.13	1.34	...	...	...	...	...	...
33-33.9	...	...	...	...	...	...	...	1.32	...	1.28	...	...	...	1.18	1.28	1.20	1.17	1.38	...	...	...	$1.19	...	...
34-34.9	...	...	...	...	...	...	...	1.37	...	1.32	...	...	...	1.22	1.32	1.25	1.20	...	...	...	...	1.23	...	...
35-35.9	...	...	...	...	...	...	...	1.42	...	1.35	...	...	...	1.25	...	1.29	...	...	...	...	...	1.27	...	...
36-36.9	...	...	...	...	...	...	...	1.46	...	1.39	...	...	...	1.29	...	1.33	...	...	...	...	...	1.31	...	...
37-37.9	...	...	...	...	...	...	...	1.51	...	1.43	...	...	...	1.32	...	1.37	...	...	...	...	...	1.35	...	...
38-38.9	...	...	...	...	...	...	...	1.56	...	...	...	...	...	1.36	...	1.42	...	...	...	...	...	1.39	...	...
39-39.9	...	...	...	...	...	...	...	1.61	...	...	...	...	...	1.40	...	...	...	...	...	...	...	1.43	...	...
40-40.9	...	...	...	...	...	...	...	1.66	...	...	...	...	...	1.43	...	...	...	...	...	...	...	...	...	...

Newhall, McKittrick, Kern River, Kern Front and Round Mountain, 70 cents for all grades. *Posted by Union Oil Co. Same company's Brea Canyon schedule stops at $1.14 for 28 degrees and over, and Belridge and Lost Hills schedule stops at $1.32 for 37 degrees and over. By Standard Oil Co., effective October 15: El Segundo, 14 to 18.9 degrees, 80 cents; 19-19.9, 82 cents; 20-20.9, 85 cents; 21-21.9, 88 cents; 22-22.9, 92 cents; 23-23.9, 95 cents; 24-24.9, 99 cents; 25-25.9, $1.03; 26-26.9, $1.06; 27-27.9, $1.10; 28-28.9, $1.14; 29-29.9, $1.17; 30-30.9, $1.21. Wilmington, 14 to 16.9, 75 cents; 17-17.9, 77 cents; 18-18.9, 79 cents; from 19 degrees upward, prices same as Signal Hill.

Market Record of Active Oil Stocks

Compiled by Carl H. Pforzheimer & Co., 25 Broad Street, New York City, Member New York Stock Exchange and New York Curb Exchange

New York Stock Exchange

1939 High	1939 Low	Week ending Mar. 18 High	Week ending Mar. 18 Low	Week ending Mar. 18 Close	Stocks—	Total shares outstanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1938	Com. sh. earn. 1937	Com. sh. earn. 1936	1938 High	1938 Low	1937 High	1937 Low
69½	60¼	66¾	62½	62½	Amerada Corp.	788,675	N.P.	50cQ	1-31-39	$2.00	$3.04	$2.52	78	55	111⅞	51½
23½	20⅞	22⅜	21	21	Atlantic Refining	2,663,999	$25	25cQ	3-15-39	1.00	3.51	2.59	27⅜	17¾	37	18
21½	15⅜	19¼	16½	16¾	Barber Asphalt Co.	390,223	$10	75c	12-16-37	....	1.91	1.14	23¾	12⅛	43⅜	10⅛
19½	14¾	17⅜	15	15½	Barnsdall Oil Co.	2,250,344	$5	25cQ	2-1-39	1.00	.85	1.01	21⅜	10⅛	35¼	10
9¼	8	8¾	8⅛	8¼	Consolidated Oil Corp.	13,915,167	N.P.	20cQ	2-15-39	.80	1.48	1.18	10¾	7	17⅞	7
31½	26	30	27¾	28	Continental Oil of Delaware	4,682,583	$5	25cQ	3-31-39	‖1.00	2.98	2.05	35¾	21¼	49	24
8⅜	6½	7¾	6⅝	6¾	Houston Oil (new)	1,098,618	$25	....	10-17-30	....	.94	—.03	9¾	5	17⅝	4¾
16½	13⅝	16¼	14½	14½	Mid-Continent Petroleum	1,857,912	$10	35c	12-1-38	.60	2.86	2.57	22⅝	12¼	35⅝	14
14⅞	12¼	13½	12¼	12¼	Mission Corporation	1,382,945	$10	$1	6-29-38	1.00	1.31	.48	17¾	10⅝	34	15
15½	10⅛	12⅝	10⅛	10½	National Supply	1,155,170	$10	$2 pf.‡	12-22-37	....	4.90	2.02	23	12½	41⅜	17⅝
10¼	8¼	9⅛	8¼	8⅜	Ohio Oil Co.	6,563,377	N.P.	20c	12-15-38	.20	1.30	.70	14⅞	8⅞	22⅞	8
11⅞	10¼	11¼	10¼	10¼	Pacific Western Oil	1,000,000	N.P.	50c	12-20-38	.50	1.39	1.58	15⅞	10¼	29¾	11¾
6¾	6¼	..	..	..	Pan American Pet. & Trans.	4,702,945	$5	$1*	12-21-37	....	1.18	.52	9¼	6¼	17⅛	7
43¾	37⅛	41½	38½	39	Phillips Petroleum	4,449,052	N.P.	50cQ	3-1-39	‖2.00	5.42	4.02	44⅜	27¼	64	30⅛
22½	20¼	22¼	20¼	20¾	Plymouth Oil Co.	1,029,800	$5	35cQ	3-31-39	1.40	2.85	1.65	25⅜	15	29⅞	13
11¼	8¾	10¼	9	9⅛	Pure Oil Co.	3,285,120	N.P.	25c	12-1-37	....	2.15	1.63	13½	8¼	24⅜	8¾
10¼	8½	9¾	8½	8⅝	Richfield Oil Corp.	3,896,638	N.P.	50c	12-21-38	.50	.35	....	9⅞	5	6½	4⅛
22⅜	19	21	19	19	Seaboard Oil of Delaware	1,244,383	N.P.	25cQ	3-15-39	1.00	1.97	2.00	27½	15½	54⅛	16
15⅛	11¾	14	12⅜	12⅜	Shell Union Oil	13,070,625	N.P.	35c	12-20-38	.70	1.44	1.57	18⅝	10	34¾	14⅞
29½	21	26	23½	24	Skelly Oil	1,003,949	$15	50c	12-15-38	1.00	6.07	4.42	34¾	18½	60⅝	26½
13¾	12	13½	12¼	12⅜	Socony-Vacuum	31,151,071	$15	25cSA	3-15-39	.50	1.82	1.38	16⅜	10¾	23¼	13
30⅛	26¾	30⅛	28	28	Standard Oil of California	13,014,754	N.P.	30cQ†	3-15-39	1.40	3.17	1.79	34⅞	25⅛	50	27⅛
29⅛	26⅛	28¼	26½	26⅝	Standard Oil (Indiana)	15,267,030	$25	25cQ	3-15-39	1.00	3.66	3.09	35½	24¾	50	26½
50⅜	50⅜	..	..	..	Standard Oil of Kansas	112,837	$10	$2	12-8-38	2.00	6.93	1.91	50⅛	32½	43	30⅝
53¼	47¼	50	46¼	46¾	Standard Oil of New Jersey	26,224,767	$25	50c§	12-15-38	§1.50	5.64	3.73	58⅜	39¾	76	42
66	55	60¾	59½	59½	Sun Oil	2,316,484	N.P.	25cQ	3-15-39	1.00	3.86	3.25	65⅛	45	77½	44½
3¼	2½	2⅞	2½	2⅝	Superior Oil Corp.	1,388,079	$1	10c	12-28-38	.10	.32	.14	4¼	1¾	7¾	1½
48¼	42½	45	42⅛	42½	Texas Corp.	10,875,006	$25	50cQ	4-1-39	2.00	5.02	4.10	49⅝	32⅝	65⅛	34⅜
5¾	4⅝	5½	4⅝	4¾	Texas Gulf Producing Co.	888,142	N.P.	15c	12-15-38	.15	.68	.93	5⅞	2⅝	9⅝	2
10⅛	8¼	9¼	8⅝	8⅝	Texas Pacific Coal & Oil	888,236	$10	10c	3-1-39	.40	1.11	.72	12½	7	16⅝	5⅝
14¼	12¼	14⅛	12⅞	12⅞	Tide Water Associated	6,369,175	$10	25cQ	3-1-39	1.00	2.08	1.03	15¾	10⅛	21⅝	13⅛
19¾	18¼	19½	19	19	Union Oil of California	4,666,270	$25	30cQ	2-10-39	1.20	2.58	1.40	22½	17⅛	28¼	17½
23⅝	21	22¾	22⅛	22⅛	Union Tank Car Co.	1,200,000	N.P.	30cQ	3-1-39	1.30	1.70	1.76	23½	20	31½	22
3¾	2⅞	3⅜	3⅜	3⅜	Wilcox Oil & Gas	506,522	$5	....	5-10-28	....	.24	—.06	3½	1⅝	6¼	1⅜

*Payable in 3½ per cent notes. †Includes extras. ‡One-tenth share $2 preferred stock. §Also 1⅛ per cent stock dividend. ‖Also right to subscribe to bonds.

New York Curb Exchange

1939 High	1939 Low	Week ending Mar. 18 High	Week ending Mar. 18 Low	Week ending Mar. 18 Close	Stocks—	Total shares outstanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1938	Com. sh. earn. 1937	Com. sh. earn. 1936	1938 High	1938 Low	1937 High	1937 Low
9	7⅜	8⅛	7¾	7¾	American Republics Corp.	1,308,049	$10	10c	7-11-38	$0.10	$0.27	$0.28	11¾	5	10	6⅝
7¼	5¼	5¾	4⅞	4⅞	Bridgeport Machine Co.	260,000	N.P.	$1.25	12-30-37	....	1.90	1.26	10¼	4⅞	21⅜	7
33	27¼	33	30¾	30¾	Buckeye Pipe Line Co.	200,000	$50	50c	3-15-39	2.00	4.02	4.40	39	22½	51½	36
130	121½	125	123	125	Chesebrough Mfg. Co.	120,000	$25	$1.50Q†	3-27-39	6.50	6.73	7.46	128	97	12	95½
9¼	6⅝	7⅞	6¾	7⅛	Cities Service (new)	3,714,317	$10	....	6-1-32	....	1.02	.13	11	5⅛	5⅜	1½
1⅛	13/16	13/16	13/16	13/16	Cosden Petroleum	462,551	$1	....	.....	....	.19	....	2⅜	⅞	5½	1½
23¾	19½	21	19⅛	19⅜	Creole Petroleum	6,975,383	$5	50cSA†	12-15-38	1.00	1.61	1.23	27½	17½	38⅜	20¼
7⅛	6¼	6⅝	6½	6½	Darby Petroleum	351,390	$5	25cSA	1-15-39	.50	1.36	1.26	10¼	5½	18⅝	6½
2	1¾	2¼	2	2	Derby Oil & Refining	263,162	N.P.	....	.....	....	1.34	.66	3½	1½	8⅜	2¼
20	20	..	..	..	Eureka Pipe Line	50,000	$50	50c	2-1-39	3.00	—.12	—.62	31	16	47½	24½
40	35⅞	39¼	37	37	Gulf Oil Corp.	9,076,202	$25	25cQ	4-1-39	1.00	3.51	2.90	46⅞	33	63½	33
69⅜	60⅛	63¼	60⅝	61	Humble Oil & Refining	8,987,840	N.P.	37½c	4-1-39	3.00	5.22	3.80	72⅝	56	87	54⅞
17	16	17	16¼	16¼	Imperial Oil of Canada	26,965,078	N.P.	62½cSA†‡	12-1-38	1.25	.98	.95	19½	14⅛	24¼	14½
7	6⅛	6½	6⅛	6⅛	Indiana Pipe Line	300,000	$10	20c	11-15-38	.50	1.03	1.00	9⅜	6	15	5⅞
27½	24¾	27	25⅞	25⅞	International Petroleum	14,324,088	N.P.	$1.25†‡	12-1-38	2.50	....	1.81	31¼	21	39½	23½
3½	2¾	..	..	..	Kirby Petroleum Co.	500,000	$1	10c	4-15-38	.10	.17	.20	5	2⅛	8¾	2⅝
20¼	17½	18⅞	18½	18½	Lion Oil Refining	434,820	N.P.	25cQ	12-15-38	1.00	2.17	1.43	25⅛	15⅝	34	12½
9½	8⅝	9⅜	8⅝	8⅝	Lone Star Gas	5,553,747	N.P.	20c	4-20-39	.60	1.14	1.02	10⅜	6⅝	14¼	5¼
7¾	6¾	7⅛	6¾	6¾	Louisiana Land & Exp.	2,977,449	N.P.	10cQ	3-15-39	.45	.58	.64	9⅜	6½	15¼	6¾
8¾	8⅛	8½	8½	8½	Midwest Oil Co.	998,444	$10	50c	12-15-38	1.00	1.14	.95	9¾	6⅝	14⅝	6¼
5⅜	4⅞	5½	5¼	5¼	Mountain Producers	1,593,584	$10	30cSA	12-15-38	.60	.76	.62	5¾	4½	7⅞	4¼
13½	12	13⅛	12	12	National Fuel Gas	3,810,183	N.P.	25cQ	1-16-39	1.00	.96	1.19	14⅝	11½	19½	12
8½	7¼	8½	8⅛	8¼	National Transit	509,000	$12.50	40c	12-15-38	.75	1.19	.79	9¼	6½	12½	7¼
1⅝	1½	1⅝	1⅝	1⅝	New Mexico and Arizona	1,000,000	$1	1c	12-1-37	....	.02	.02	2⅝	1½	5	1⅜
4½	4	..	..	..	New York Transit	100,000	$5	15c	4-15-39	.25	.49	.34	4½	3½	5⅜	3⅜
5½	4½	5⅝	5¼	5⅜	Northern Pipe Line	120,000	$10	15c	12-1-38	.35	.78	.66	6	4	12⅜	5⅜
7⅝	5½	6½	5½	5¾	Pantepec Oil	2,441,142	$1	....	.....	....	....	.05	7¾	3½	9⅝	2⅜
2¾	1⅞	2¼	2⅛	2⅛	Root Petroleum Co.	336,045	$1	25c	2-1-37	....	—.17	.45	4½	1⅝	12¾	2
2⅜	1⅞	2½	2½	2½	Ryan Consolidated	296,931	N.P.	....	.....	....	.46	....	4	2⅛	6½	2¼
3	2⅛	..	..	..	Southern Pipe Line	100,000	$10	15cSA	3-1-39	.30	.85	.41	5⅜	3¼	7¼	3⅞
34⅞	32	34½	33	33	South Penn Oil	1,000,000	$25	37½cQ	3-31-39	1.75	4.64	3.59	39	28¾	56	35
19	17	19	19	19	Southwest Penna. Pipe Lines	35,000	$50	50cQ	12-28-38	2.00	.95	.97	22¼	16½	42	20
18¾	17½	18½	17⅞	17⅞	Standard Oil of Kentucky	2,604,790	$10	50cQ†	3-15-39	1.25	1.60	1.46	18¾	15	21⅛	14¾
6¾	6	6¾	6⅜	6½	Standard Oil of Nebraska	166,403	$25	25c	3-29-37	....	—.58	.42	8¾	5½	13¾	8
21¼	19	20⅛	19¾	19¾	Standard Oil of Ohio	753,740	$25	25c	3-15-39	1.00	3.67	4.77	22¾	16¼	45	16
2⅝	2	2¼	2⅛	2⅛	Sunray Oil	2,006,176	$1	5c	4-27-39	.05	.42	.26	3¼	2	4⅞	2
4	3	3⅜	3¼	3⅜	Texon Oil & Land	936,024	$2	15cQ	9-30-38	.60	.51	.36	5¼	3½	7⅝	2
5½	4	3⅞	3⅞	3⅞	Transwestern Oil Co.	750,000	$10	....	.....	....	.48	.06	7⅝	4¼	13⅞	4⅝
3⅜	2⅝	2⅞	2½	2½	United Gas Corp.	7,818,959	$1	....	.....	....	.25	.20	5¼	2⅝	13⅞	3

†Includes extras. ‡Payable in Canadian funds. §Of which $1 was in preferred stock.

Personal Paragraphs

J. A. JAMESON, general manager of the production department, and N. A. GASS, deputy manager of the commercial department, which includes distribution, shipping and accounts, have been elected to the board of Anglo-Iranian Oil Co., Ltd., London.

W. N. (BUDDY) O'ROARK, scout with the Standard Oil Co. of Louisiana, was honored last week at a stag party at the 40 and 8 Club, Shreveport, given by scouts and old-timers of the North Louisiana oil industry. The occasion was completion of 20 years of scouting by Mr. O'Roark, who now is covering coastal and Central Louisiana activity for the Standard.

BEN MORGAN, CURTIS DAVIS, B. L. RAY, and A. L. TENSER are in charge of arrangements for the spring convention of the Virginia Oil Men's Association to be held in the John Marshall Hotel in Richmond May 11 and 12.

ERNEST O. THOMPSON, member of the Texas Railroad Commission, will speak at the meeting of the East Texas Chapter of the American Petroleum Institute Division of Production in Kilgore, Tex., March 28 on the national view of the oil industry.

J. D. ROGERS, sales manager in the Australian states for the Vacuum Oil Co., arrived in California from Australia a few days ago for a series of conferences with executives of the General Petroleum Corp., California affiliate of the Socony-Vacuum.

ERIC V. WEBER, Cincinnati, vice president for marketing of the American Petroleum Institute and president of the Ohio Petroleum Marketers Association, is supervising work preliminary to the organization of a regional public relations committee in Ohio. That state will constitute Region No. 10.

A. F. HICKEY has been appointed general manager of the Imperial Refining Co., Grand Rapids, Mich. Recently he has been associated with Midwest Refining Co., Alma, Mich., as sales executive. He will continue with the latter in advisory capacity. For several years he was vice president in charge of sales for Naph-Sol Refining Co., Muskegon, Mich.

FERNAND GILABERT has been appointed managing director of Societe Generale des Huiles de Petrole, French subsidiary of Anglo-Iranian Oil Co. He is vice president of the Chambre Syndicale de l'Industrie du Petrole and president of the Comptoir Auxiliarie du Petrole, the company responsible for the quota system under which the French oil industry functions.

Dr. A. C. LANE, chairman of the National Research Council's committee on "The Age of the Earth," will speak before a joint meeting of the Tulsa Geological Society and the Mid-Continent Section of the American Institute of Mining Engineers in the Kendall Hall auditorium, University of Tulsa, Monday evening, March 27. Dr. Lane's subject will be "Does Mother Earth Show Her Age?" The meeting will be open to the public.

LEO R. FORTIER, formerly division geologist for Shell Petroleum Corp. and until recently with the Bakersfield, Calif., division of the Shell Oil Co., has opened consulting offices in Wichita, Kans.

W. C. WENZEL, of New York, manager of the petroleum division of Dun & Bradstreet, Inc., was in Texas last week in the course of an itinerary, which includes the country's oil centers, designed to reveal the condition of the oil industry.

SHIFTS: M. M. MILLER, superintendent Josaline Producing Co., from Okemah, Okla., to Graham, Tex.; ROBERT L. SHICK, engineer Stanolind Oil & Gas Co., from Stafford, Kans., to Zenith, Kans.; MELVIN D. MAUCK, geologist Pure Oil Co., from Boonville, Ind., to Washington, Ind.; JOHN DOERING, geologist Kirby Petroleum Co., from Houston, Tex., to Dallas, Tex.; G. A. LEE, superintendent Humble Pipe Line Co., from McCamey, Tex., to Midland, Tex.; T. V. JENKINS, superintendent Stanolind Oil Purchasing Co., from Jennings, La., to Beaumont, Tex.; GERALD B. SILER, geologist Carter Oil Co., from Altamont, Ill., to Oklahoma City, Okla.; RAYMOND S. HUNT, geologist Michigan Devonian Petroleum Co., from Saginaw, Mich., to Grand Rapids, Mich.; R. D. CLARK, Clark & Cowden Drilling Corp., from Norman, Okla., to Vandalia, Ill.; OWEN A. WINSOR, engineer Gulf Oil Corp., from Perry, Okla., to Hobbs, N. M.

Do You Remember?

From The Oil and Gas Journal Files

25 YEARS AGO

Joseph A. Holmes, director of the Bureau of Mines, in his annual report indignantly denies that "the purpose of the bureau is to increase the profits of the big mine owners," as some critics have charged, and gives an outline of the valuable work of the bureau in respect to the conservation of natural gas, petroleum, coal and other minerals by the prevention of waste.

Atlantic Refining Co., at $685 bid and $695 asked is the highest priced of the Standard Oil stocks. Par value is $100 per share. All Standard Oil stocks are above par. Among the non-Standard stocks, Texas Co. is $148 bid; Gulf Oil Corp. $135 bid, and Devonian Oil Co. $155 bid, all being $100 par stocks.

20 YEARS AGO

The best well yet found in Okfuskee County, Oklahoma, in Section 15-12-11, starts off at 300 bbls. per day and has opened a hot leasing campaign in that county.

The Empire Companies recently moved into their new offices in Bartlesville, Okla. The companies rent 125,000 square feet of room in the nine-story Masonic temple.

W. H. Hanna, president of the Imperial Co. of Canada, dies in Augusta, Ga., where he had gone in search of health.

10 YEARS AGO

The American Petroleum Institute board of directors approves a plan to reduce the production of crude in 1929 to the 1928 level.

The big public demand for antiknock gasoline has resulted in 50 marketing companies obtaining licenses to distribute Ethyl gasoline.

The prevention of crooked holes in well drilling is the next problem of the industry, geologists say.

FLOYD C. DODSON, San Angelo, Tex., oil man, has returned from a vacation of several months in southeastern Alabama.

CHANNING SCHWARTZ, geologist, formerly with the Carter Oil Co., in Ardmore, Okla., has been transferred to the Standard Oil Co. of Louisiana, in Shreveport, La.

CARL BEAL, director and large stockholder of the Tide Water Associated Oil Co., besides being a geologist and independent operator, left Los Angeles Harbor this week for a trip to Honolulu. He will be gone three weeks.

E. C. HEIDRICK, Jr., of Peoria, Ill., was in West Texas last week inspecting his production in Pecos County, along the Pecos River. He was accompanied by his nephew, TED PAGE, JR., and WILLIAM S. MILES, JR., both of Peoria.

FRANK F. HILL, special representative of the field department of the Union Oil Co. of California, and for the past several years in charge of properties in Texas, Oklahoma, Kansas and other areas east of the Rockies, will retire April 1 after 40 years of continuous service with the company, which is 49 years old.

PAUL W. PITZER, Breckenridge, Tex., oil man and member of the firm Pitzer & West, is in a Fort Worth, Tex., hospital, recovering from multiple fractures of the left leg suffered when he and his father, J. E. PITZER, were struck by an automobile. The older man is in a Breckenridge hospital, suffering from a fractured skull.

HOWARD E. FELT, secretary of the Warren Petroleum Corp., accompanied by Mrs. Felt, returned this week to Tulsa from a month's vacation in Bermuda.

M. L. CASHION, assistant general superintendent in the Gulf Coast division for the Gulf Oil Corp. at Houston, Tex., returned to his desk last week from a business trip to California.

HUGH M. STALCUP, vice president of the Skelly Oil Co., Tulsa, will be the principal speaker at a dinner given by the Independent Petroleum Association of America in Shreveport, March 24.

JAMES A. SINCLAIR, engineer for the Magnolia Petroleum Co. in the North Texas district, has been transferred to Alice in South Texas as division engineer for the gas and gasoline department.

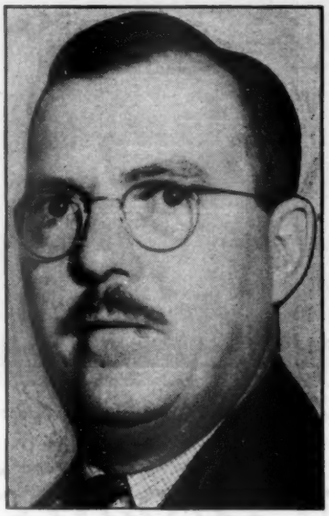
JOHNSTON DeFOREST, attorney of New York, has been elected to the directorate of the Tide Water Associated Oil Co., filling the vacancy created by death of his uncle, Henry W. DeForest, several months ago.

R. R. PUGH, assistant general manager of Commonwealth Oil Refineries, Ltd., of Australia, is spending a few weeks in London, where the home offices of the parent company, Anglo-Iranian Oil Co., Ltd., are located.

WILLIAM G. HELIS, president of the Lincoln Oil Co., New Orleans, La., will sail for Greece next month to supervise initial operations on properties for which he has acquired exploration rights. A drilling crew of 11 men is sailing this week to begin operations in the new area.

That Old Bottom Rung

Although Henry E. Zoller, Kansas division manager for the Shell Petroleum Corp., had an engineering degree and several years' field experience when he entered the company's service January 1, 1925, he went to work as a roustabout, for it seems the Shell organization has some ideas about the importance of beginning engineering training at the bottom rung. Advancement was steady, however, and in 1928 young Zoller was made a district engineer. During the next four years he served in that capacity at Tonkawa and Braman, Okla.; Amarillo, Tex., and the East Texas field. In 1932 the company sent him to The Hague, Holland, home of the parent company, to broaden his grasp of Shell policies. Upon his return to this country Mr. Zoller was made division engineer at Houston, Tex., Tulsa, and McPherson, Kans., in order. In July, 1936, he became district superintendent at McPherson, and the next year he was promoted to his present post, with headquarters in Wichita. Recently he was named chairman of a committee organized by operators in the South Trapp pool in Barton County, Kansas, to formulate production regulations.



H. E. ZOLLER

While attending the Missouri School of Mines, from which he graduated in 1923, the young man worked at oil jobs during vacations. After getting his degree he did geological work and production engineering for the M. M. Valerias Oil & Gas Co., in Russell, Kans.

ROBERT WELLS, assistant to the president of the Standard Oil Co. of Venezuela, arrived in New York March 14 aboard the Santa Elena on a leave from his post in Caracas.

WILLIAM FAHLEY was elected president of the Valley Petroleum Retailers, Inc., organized by marketers in the Oshkosh district of Wisconsin. CHARLES GREEN is vice president, EDGAR ABRAHAM secretary, and HERBERT BORK treasurer.

G. M. KINTZ, U. S. Bureau of Mines, Dallas, Tex., spent several days last week in the Shreveport, La., area, demonstrating explosive gases to members of the Doherty Men's Fraternity, associated with the Arkansas Fuel Oil companies of that area.

KIRK E. BOONE, of the Bankline Oil Co., and RALPH E. FORCH, of the Wilshire Oil Co., left Los Angeles this week for Washington, D. C., to attend the hearings and oppose the Nye and Hobbs resolutions for government appropriation of California tidelands.

G. T. DOUGHERTY, special salesman reseller in the St. Louis, Mo., sales division of Standard Oil Co. of Indiana, has been promoted to manager of the lubricating bulk sales department in the Chicago general office to succeed L. G. CAMPBELL, who resigned.

HERMENEGILDO DIAZ, of Mexico City, certified public accountant and auditor for Petroles Mexicana, government oil company, spent several days in Houston, Tex., last week. With Mrs. Diaz and their daughter, Josephine, he said he was in this country for "a summer vacation." Mr. Diaz would not discuss the industry which employs him. "I'm an auditor," he said.

JOSEPH C. SMITH, of the Smith-Wiehman Oil Co., was elected president of the New York Oil Trades Association this week. W. H. CORREA, Standard Oil Co. of New York, was chosen vice president; ALBERT J. SQUIRES, Squires & Anderson, secretary, and RUDOLPH SONNEBORN, L. Sonneborn Sons Co., treasurer.

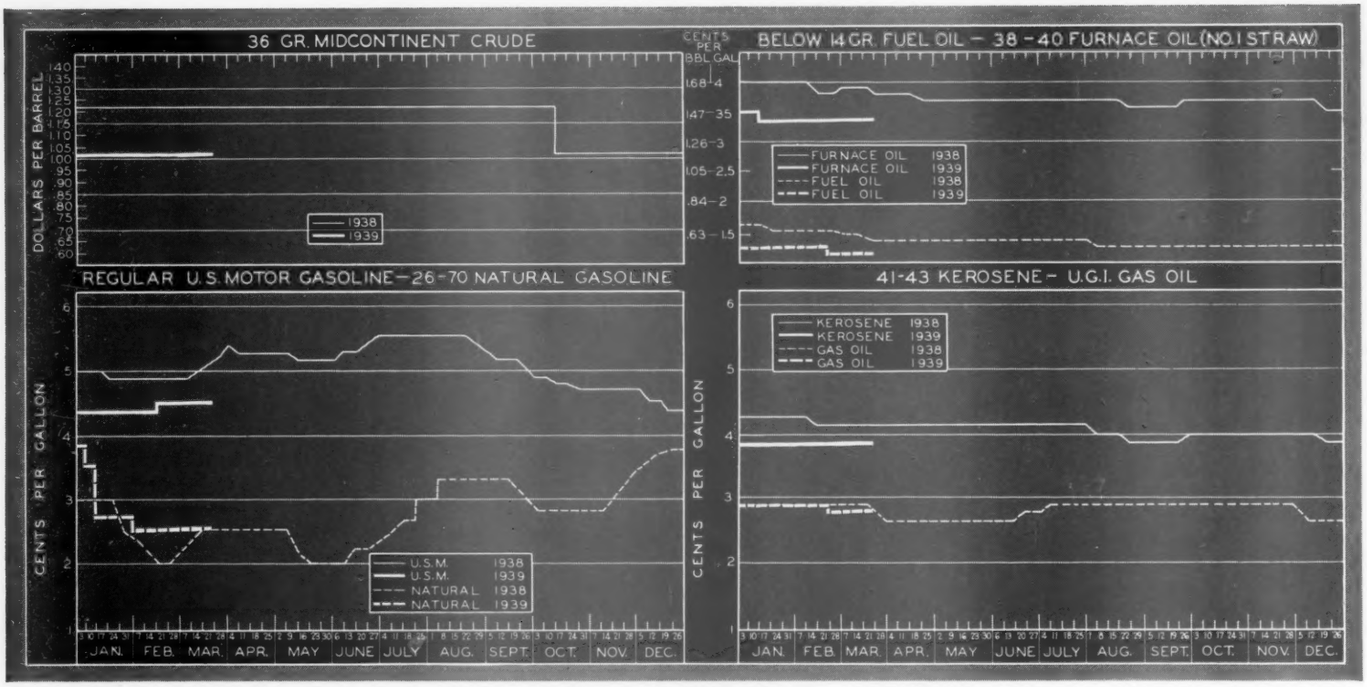
C. L. HIGHTOWER, United Gas Pipe Line Co., Houston, Tex., has been named chairman of the American Petroleum Institute's Division of Production 1939 committee on fire prevention. D. V. STROOP, of the Institute staff, is secretary. Members of the committee are: MAX ANFENGER, Standard Oil Co. of California, San Francisco; P. R. APPLEGATE, Northern Group of Pipe Lines, New York; H. W. BOGGESS, Sinclair Prairie Oil Co., Tulsa; A. W. BREELAND, Lone Star Gas Co., Dallas; PAUL HUBBARD, Gulf Oil Corp., Houston; W. C. KINSOLVING, Sun Pipe Line Co., Beaumont, Tex.; R. J. LAUDER, Shell Petroleum Corp., Tulsa; J. D. McCamey, Carter Oil Co., Tulsa; T. S. MAFFITT, JR., Houston Oil Co. of Texas, Houston; B. A. MOELLER, General Petroleum Corp. of California, Vernon, Calif.; C. J. NOBMANN, Shell Oil Co., San Francisco; A. S. PATRICK, Texas Co., Los Angeles; H. C. RENZ, Atlantic Refining Co., Dallas, Tex.; R. B. ROAPER, Humble Oil & Refining Co., Houston; P. G. WEIDNER, Stanolind Oil & Gas Co., Tulsa; H. J. WILSON, Tide Water Associated Oil Co., San Francisco; J. H. WOOD, JR., Atlantic Pipe Line Co., Dallas.

E. P. HUBBARD, of Houston, Tex., was elected chairman of the southwestern district, Division of Production, of the American Petroleum Institute, at the close of the two-day spring meeting of the division, in San Antonio, last Friday. He succeeds W. S. MORRIS, of Kilgore, who was elected chairman of the advisory committee. Other officers chosen were R. L. CARRUTHERS, of Beaumont, vice chairman for the Gulf Coast; HAROLD DECKER, of Corpus Christi, vice chairman for Southwest Texas; L. A. OGDEN, of Fort Worth, vice chairman for North and West Texas; T. W. JOHNSON, of Shreveport, La., vice chairman for Arkansas and North Louisiana; C. G. STALEY, of Hobbs, N. M., vice chairman for New Mexico; J. P. STRAIGHT, of Gladewater, vice chairman for East Texas, and J. U. TEAGUE, of Houston, secretary-treasurer.

GENE NESBITT, in the geological department of the Gulf Oil Corp. for the past three years, has been transferred from Fort Worth, Tex., to the wildcat exploration area of Venezuela.

CLEMENT A. BARRERE has resigned as manager of the Bradford Oil Refining Co., Bradford, Pa., to join the Lummus Co., New York, as process and sales engineer. Before his association with Bradford, Mr. Barrere was in charge of lubricating oils for Phillips Petroleum Co. and previous to that he was with the Texas Pacific Coal & Oil Co. 10 years.

F. S. SHOUP, Los Angeles district sales manager of the Associated Oil Co.; P. E. ALLEN, domestic sales manager; HAROLD R. DEAL, advertising and sales promotion manager; WALTER BRUNN, merchandising manager; W. A. REANIER, white oil sales manager; E. C. HEINZ, assistant white oil sales manager; F. L. WAGER, manager of automotive oil and grease sales; J. RANSFORD, supervisor of sales training, and B. W. SEARS, advertising assistant, were in southern California this week in connection with the company's annual sales promotion program.



Representative Mid-Continent Quotations on Crude Oil and Refined Products, Basis Oklahoma (Group 3)

Refinery Market in Group 3 Territory Discloses Still Firmer Undertone

By T. F. SMILEY

The note of cheerfulness pervading the Group 3 refinery market was more pronounced this week. Sales managers reported a firmer undertone in virtually all divisions except the heating oils, and even these were holding up better than expected. Gasoline was acquiring more strength daily. The naturals were surprisingly steady. Wax retained its distinction as the tightest product. The lubricants were shedding some of their discouraging aspects. Tractor fuels were gaining.

Tank-Wagon Prices Advanced

Following the step taken last week by the Standard Oil Co. of Indiana in advancing subnormal gasoline prices to dealer and tank-wagon consumers in most of its territory, major refiners announced similar action in Oklahoma. Where the old tank-wagon price was 12½ cents or lower it was increased one-half cent. Where the old price was less than 11 cents it was raised to 11 cents. Normal tank-wagon prices for the state as revised follow: Ethyl, 15 cents; house-brand, 13½ cents; third-grade, 12½ cents; kerosene, 8 cents. A statewide increase of 1 cent in the tank-wagon prices of the three grades of gasoline was posted in Texas by major refiners last week. The new prices in the two states contributed much to the better feeling in the trade and were a factor in the firmer tankcar quotations.

The six weeks ending March 11 saw 8,687,000 bbls. of gasoline added to stocks, and that is 1,406,000 bbls. more than went to storage in the corresponding period last year. But figures relating to mounting stocks do not look so ominous as they did a few weeks ago. It is pointed out that while gasoline stocks are larger than they should be, they are about 7 per cent lower than they were a year ago. At the same time consumption is estimated as not far from 8 per cent better than it was in 1938, with likelihood of going to record-breaking heights.

Gasoline stocks in the Mid-Continent territory are believed to be largely the result, not of reckless runs to stills, but of buying on the part of refiners who expect to need the material to meet peak-season demands. One large integrated company, which has been making substantial purchases, is reported to be 1,000,000 bbls. short of its estimated requirements for 1939.

The natural gasoline market has moved into a position which now and then gives it a marked appearance of tightness. Some suppliers who had oversold their output have been finding themselves pressed at times to obtain material needed to fill orders. Also buyers who in the past have had the advantage of favorable freight rates now find material hard to get at the points from which they had received these rates. Turning to other sources of supply, where the freight rates are less advantageous—as some Kansas buyers, for example, are doing—they have been obliged to do some active shopping before finding available material. This is not indicative of scarcity of supply, but rather of unwillingness of large manufacturers to sell at the present low level of prices. They prefer to store for fall.

Cold Weather Helps Heating Oils

It was believed this week that the heating oils would escape much of the demoralization which a few weeks ago seemed likely to overtake them. Prolonged cold weather in northern states, while interfering with motor travel, has helped in the liquidation of surplus inventories of light fuels. Tractor fuels were moving in substantial volume.

Neutrals and bright stocks were firmer. Refiners who had been shading prices were assuming a less pliant attitude. Wax was up and increasingly tight. Little was available in the spot market, and at least one company was quoting 3 cents a pound for 124-126 crude scale if bought in less than carload lots. Some material for export brought 2¾ cents.

Refined Oil Market Barometer

Less uneasiness is manifested over the country's huge gasoline stocks, which many analysts expect to melt under a record-breaking demand during the coming summer. Furnace oils weak. Heavy industrial gaining ground. Lubricating oils firmer in the East and making gradual gains in the Mid-Continent area. Natural gasoline steady, with offerings few. Tractor fuel active.

MID-CONTINENT. Gasoline firm. Heating oils weak. Lubricating oils improving.

EAST COAST. Light fuels sharply off. Gasoline steady. Industrial fuel firm.

GULF COAST. Gasoline weak. Fuel oils soft. General market dull. Prices unchanged.

PENNSYLVANIA. Gasoline holding. Lubricating oils strong, low-pourpoint neutrals leading.

CALIFORNIA. Market soft. Diesel losing ground, with prices headed downward.

CHICAGO. Gasoline gaining. Kerosene and tractor fuel steady. Heavy fuel firm.

Light Fuels Decline in East, But General Market Encouraging

By H. STANLEY NORMAN

NEW YORK, Mar. 21.—Fuel oil prices along the North Atlantic seaboard surrendered more ground last week under the combined influence of a fading burning season and more abundant offerings from primary markets. The tankcar and tank-wagon quotations for practically all grades of fuel and shore plant Diesel oils were off a quarter of a cent per gallon from the market of the preceding week. The large suppliers gave ground reluctantly and spread their reductions averaging a quarter of a cent over two closely related cuts of an eighth of a cent each. The New York tankcar price for No. 2 and No. 4 burning oil, for distillate fuel oil and for shore plant Diesel oil ranges from 3¾ cents downward to 3½ or 3⅝ cents per gallon. A few suppliers were reported willing to shade the low of the range for barge deliveries. The first drop of an eighth of a cent developed over the week-end and was made effective on March 11. The second drop of an eighth of a cent followed on Monday and Tuesday, March 13 and 14.

In keeping with the weakened tankcar market structure, Standard Oil Co. of New Jersey lowered the tank-wagon price on kerosene at Baltimore a cent per gallon on March 9 and dropped No. 2 and No. 4 fuel oil throughout New Jersey a quarter of a cent to 5¾ cents on March 14. In the outlying districts of Long Island and Westchester County, fuel oil suppliers lowered tank-wagon quotations in keeping with the general market and were making deliveries last week at 6 cents per gallon, off a half cent from the high for the winter.

Terminals at Providence, R. I., and New Haven, Conn., were reported offering kerosene in tankcars at 4.4 and 4½ cents, respectively. Blame for collapse of the southern New England kerosene market was placed on demoralization of the New York price structure which permitted infiltration of marked-down products.

Although the East Coast motor fuel market has been slow to pick up the stronger tone manifested in the Mid-Continent and in the Middle West, it generally has successfuly resisted recent depressing influences. Some suppliers were reported willing to shade current prices on 65-octane motor fuel, largely because of the lack of storage facilities to accommodate fresh cargoes en route from the Gulf Coast. An uninterrupted series of four Sundays of rain or snow holding automobile operation below normal has depressed consumption in this immediate area. However, the national gain of 8 per cent in January motor fuel demand compared to a year ago has served to place a little more backbone in the general gasoline market. The general motor fuel increase in Texas, in subnormal portions of the Standard Oil Co. of Indiana territory and in other parts of the Mid-Continent also served to bolster the market attitude in this section although conditions appear not to have warranted an immediate advance. Supplies of motor fuel, while not abundant at price concessions, can be obtained on the Gulf Coast and until this condition is corrected the New York market is not expected to show normal spring strength.

Stocks of motor fuel at eastern seaboard terminals are reasonably high because of the anticipated demand within the next few weeks to supply requirements of visitors motoring to the New York World's Fair and to New England vacation spots. The relatively high position of stocks has been important in pressing small volumes of motor fuel upon the tankcar market at fractions below generally posted prices because of the need for some distributors to keep their inventories turning at a high rate.

There have been no further important changes in the motor fuel retail market in the northeastern territory. Subnormal tank-wagon prices remain in effect in Buffalo, New Haven and Boston and the tankcar consumer market is weak at Boston and Providence in particular and at the other New England points in general. Most market observers are in agreement that the motor fuel prices will respond promptly to the first surge of spring and early summer demand in this territory.

General developments last week contributed to a more optimistic outlook for refined markets in the immediate future. Action of Texas producers in petitioning for a three-month extension of the five-day producing week, price advances in the South, Mid-Continent and Middle West, Senate finance committee approval of a bill which would make permanent the Connally "hot" oil law and the prospects for inclusion of at least two more states in the interstate oil compact were among the favorable developments. A forecast that motor fuel demand in 1939 will total 541,000,000 bbls. in this country compared to 521,657,000 bbls. in 1938 also served to improve the general outlook. Announced intentions by some of the nation's leading refining units to make further reductions in motor fuel storage is considered another healthy sign.

The Gulf Coast motor fuel market is reported on firm ground in most quarters. Occasional reports were heard that gasoline could be obtained on a firm bid at fractionally lower figures than currently quoted, but no sales under this condition could be confirmed last week. There were several export inquiries in the market for motor fuel, but at least some of them were considered "feelers" of the price structure. The interest in aviation gasoline remains active. Last week's developments in Central Europe were expected to create an even more active interest in high-octane motor fuel for export shipment.

The market for Bunker C fuel oil in cargoes for coastwise shipment is firmly established at 67½ cents per barrel. The price may be shaded slightly in some directions for industrial burning oil with inferior specifications but this material is strictly limited. The domestic market for gasoline in cargoes for coastwise movement from the Gulf appeared unchanged at a range of 4¼ to 5⅛ cents per gallon, depending on octane and the source of supply. Rumors that a cargo of 65-octane motor fuel had been secured by a northern buyer at 4⅜ cents during the past 10 days could not be confirmed. The price range for 65-67 octane motor fuel was quoted in practically all quarters at 4½ to 4⅞ cents with a majority apparently settled on the high of the range on current inquiries.

The tanker charter rate has held practically unchanged during the past three weeks, although closing of fixtures has been at a minimum. The last boat reported chartered for a coastwise trip was for April loading of No. 2 fuel oil at 19 cents per barrel. In the range of charter rates earlier this month clean boats for gasoline movement were available at about 4 cents per barrel below the rate applying to vessels for transport of fuel oil. This range has since narrowed because of the greater demand for clean boats in comparison to February and March.

The New York tankcar motor fuel market was approximately unchanged at a range of 5¾ to 6⅛ cents per gallon for 65-octane material. The low of the range applied to a

(Continued on Page 154)

A. P. I. Weekly Refinery Statistics

Week Ending March 18, 1939

	Capacity reporting (per cent)	Daily crude runs (bbls.)	Total gasoline stocks	Gas oil and fuel oil stocks
East Coast	100.0	495,000	21,098,000	7,731,000
Appalachian	85.9	108,000	3,462,000	742,000
Indiana, Illinois, and Kentucky	89.5	463,000	15,654,000	5,213,000
Oklahoma, Kansas, and Missouri	81.6	238,000	8,029,000	3,997,000
Inland Texas	50.3	123,000	1,996,000	1,809,000
Texas Gulf	89.5	775,000	11,050,000	6,993,000
Louisiana Gulf	97.3	116,000	2,594,000	1,392,000
North Louisiana and Arkansas	55.0	39,000	502,000	777,000
Rocky Mountains	54.2	42,000	1,907,000	727,000
California	90.0	505,000	15,819,000	98,030,000
Total reported	85.8	2,904,000	82,111,000	127,411,000
Estimated unreported	.....	346,000	5,180,000	2,960,000
*Estimated total	.....	3,250,000	87,291,000	130,371,000
*Estimated total previous week	.....	3,205,000	85,966,000	130,646,000
*March 19, 1938	.....	3,093,000	92,303,000	121,590,000

*Bureau of Mines, currently estimated.

Stocks of Crude Oil in the United States

(BUREAU OF MINES ESTIMATES)

Week ending March 4, 1939	272,971,000 barrels
Week ending February 25, 1939	271,758,000 barrels
Week ending March 5, 1938	304,527,000 barrels

Figures do not include stocks of heavy, unrefinable California crude.

Retail Oil Markets

Tank-wagon and filling station prices on gasoline and kerosene furnished by the larger marketing firms

Prices as of March 21, 1939

Taxes

The gasoline quotations given in the following tables include the 1-cent federal tax, as well as state, county, and city taxes. The gasoline is the regular or standard grade. In most areas lower grades and a premium grade also are available.

Standard Oil Co. (Indiana)

	Gasoline			Kero.
	Tank-wag.	Dlr. tax	Inc. tax	tank-wag.
Chicago, Ill.	15.1	12.1	4.0	10.0
Decatur	15.1	12.6	4.0	10.0
Joliet	15.1	12.6	4.0	10.0
Peoria	15.1	13.1	4.0	10.0
Quincy	14.9	12.9	4.0	8.7
Davenport, Ia.	15.1	13.6	4.0	‡10.0
Des Moines	14.9	13.4	4.0	‡9.8
Mason City	15.3	13.8	4.0	‡10.2
Duluth, Minn.	16.9	15.4	5.0	10.8
Mankato	16.5	15.0	5.0	8.9
Minneapolis	16.0	14.5	5.0	10.4
LaCrosse, Wis.	16.5	15.0	5.0	10.4
Green Bay	16.9	15.0	5.0	10.3
Milwaukee	14.9	13.4	5.0	10.2
Detroit, Mich.	13.1	11.6	4.0	7.1
Grand Rapids	14.0	12.5	4.0	9.7
Saginaw	15.8	14.3	4.0	9.3
Evansville, Ind.	16.6	15.1	5.0	†10.5
Indianapolis	16.8	15.3	5.0	†10.0
South Bend	17.1	15.6	5.0	†9.0
Fargo, N. D.	16.7	15.2	4.0	11.6
Minot	18.0	16.5	4.0	12.9
Huron, S. D.	17.0	15.5	5.0	10.9
Kans. City, Mo.*	14.4	11.9	4.0	7.5
St. Louis*	14.2	12.7	4.0	8.0
St. Joseph	14.4	11.2	4.0	9.3
Wichita, Kans.	13.9	10.6	4.0	7.3

*State tax 2 cents, 1-cent city tax and 1-cent federal tax. †Does not include 4-cent state tax. ‡Does not include 3-cent state tax.

Exclusive of state general sales taxes.

Discounts to commercial consumers: On purchases per month off tank-wagon prices: 1,000 gallons or more, 1.5 cents off; minimum delivery 25 gallons.

Stanolex Fuel Oil in Chicago

Effective February 15, 1939, f.o.b. Chicago tank-wagon prices: Standard range oil, 1-99 gallons, 9 cents; 100-149 gallons, 8 cents; 150 gallons and over, 7.5 cents. Stanolex fuel oil No. 1, 1-149 gallons, 8.25 cents; 150-399 gallons, 7.25 cents; 400 gallons and over, 6.75 cents. Stanolex furnace oil, 1-149 gallons, 8.25 cents; 150-399 gallons, 7.25 cents; 400 gallons and over, 6.75 cents. Stanolex Grade A, 1-399 gallons, 5 cents; 400 gallons and over, 4 cents. Stanolex Grade B, 1-799 gallons, 4.75 cents; 800 gallons and over, 3.75 cents.

Ohio

STANDARD OIL CO. OF OHIO

	Gasoline			Kero.
	Tank-wag. con'r.	Di-vided dlr.	Inc. tax	tank-wag.
Ohio points	16.0	15.0	5.0	*13.0

*Includes state tax of 1 cent.

Southern District

STANDARD OIL CO. (KENTUCKY)

	Gasoline			Kero.
	Cons'r tank-wag.	Net dlr.	Inc. tax	tank-wag.
Atlanta, Ga.	18.5	15.5	7.0	8.5
Augusta	19.5	16.5	7.0	9.0
Macon	19.0	16.0	7.0	10.0
Savannah	17.5	14.5	7.0	8.0
Birmingham, Ala.	20.0	17.0	8.0	8.5
Mobile	21.0	18.0	9.0	8.5
Montgomery	21.0	19.0	9.0	10.5
Jackson, Miss.	17.5	14.5	7.0	9.5
Vicksburg	19.0	16.0	7.0	9.0
Jacksonville, Fla.	19.0	16.0	8.0	8.0
Miami	19.0	16.0	8.0	8.0
Pensacola	20.0	17.0	9.0	8.0
Tampa	19.0	16.0	8.0	8.0
Lexington, Ky.	19.0	16.0	6.0	10.0
Covington	17.5	14.5	6.0	9.5
Louisville	17.5	14.5	6.0	9.0
Paducah	18.5	15.5	6.0	9.0

Price basis to tank-wagon consumers: Effective January 4, 1937; 3 cents per gallon below tank-wagon price. Effective June 4, 1938, 2 cents per gallon discount eliminated from all kerosene markets in Mississippi, Alabama, Georgia, and Florida, markets being reduced correspondingly to a net basis.

Montgomery, Ala., has a county tax of 1 cent per gallon, and a city tax of 1 cent per gallon on gasoline, in addition to state tax and 1 cent per gallon on kerosene. Mobile, Ala., has a city gasoline tax of 2 cents per gallon; Birmingham, Ala., has a city gasoline tax of 1 cent per gallon; Pensacola, Fla., has a city gasoline tax of 1 cent.

Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

	Gasoline			Kero.
	Cons. tank-car	Dlr. tank-wag.	Inc. tax	tank-wag.
Atl'tic City, N. J.	10.9	12.7	4.0	7.0
Newark	10.9	12.7	4.0	7.0
Annapolis, Md.	12.85	14.35	5.0	9.5
Baltimore	12.25	13.75	5.0	7.0
Cumberland	13.65	16.15	5.0	10.0
Wash'gton, D. C.	10.50	12.0	3.0	9.5
Danville, Va.	14.45	16.95	6.0	12.9
Norfolk	13.25	15.75	6.0	11.5
Petersburg	13.55	16.05	6.0	11.7
Richmond	13.55	16.05	6.0	8.7
Roanoke	14.75	17.25	6.0	11.0
Charles'n, W. Va.	14.05	16.55	6.0	12.6
Parkersburg	13.35	14.85	6.0	11.2
Wheeling	14.35	15.75	6.0	12.2
Charlotte, N. C.	15.65	18.15	7.0	12.1
Hickory	16.15	18.65	7.0	12.5
Mt. Airy	15.95	18.45	7.0	12.3
Raleigh	15.25	17.75	7.0	11.6
Salisbury	15.75	18.25	7.0	12.2
Charleston, S. C.	14.25	16.75	7.0	10.6
Columbia	15.25	17.75	7.0	11.6
Spartanburg	15.95	18.45	7.0	12.4

Price basis to Essolene undivided dealers: Dealer tank-wagon price less .5 cent per gallon. Price basis to commercial consumers, effective March 8, 1937, in Maryland, District of Columbia, and in Arlington and Fairfax counties in Virginia; and March 12 in New Jersey: To contract accounts purchasing at least one full compartment at time by hose connection, on yearly purchases: From 2,500 to 100,000 gallons, consumer tank-wagon price at time and place of delivery; 100,000 gallons per year, consumer tankcar price plus .5 cent per gallon. Consumer tank-wagon price generally will be equivalent to dealer tank-wagon price less .5 cent per gallon.

Effective January 16, 1939, in North Carolina the commercial consumer schedule became as follows: Single deliveries of 50 gallons or more, consumer tank-wagon price. Single deliveries of less than 50 gallons, 4 cents per gallon over consumer tank-wagon price. Generally the posted consumer tank-wagon price will be equivalent to the dealer price, less .5 cent per gallon. The above policy also applies in South Carolina effective January 23, 1939.

Discounts for kerosene, 1 cent off tank-wagon price for 25 gallons or more under contract (contract not necessary in Baltimore) except no discount in New Jersey.

New York and New England

SOCONY-VACUUM OIL CO., INC.

	Gasoline			Kero.
	Cons. tank-car	Dlr. tank-wag.	Inc. tax	tank-wag.
Albany	11.5	13.8	5.0	8.0
*Met. N. Y.:				
Manhat., Bronx	11.5	12.9	5.0	8.0
Staten Island	11.5	12.9	5.0	8.0
Queens, Br'klyn	11.5	12.9	5.0	8.0
Buffalo	12.0	11.8	5.0	7.5
Rochester	12.5	13.5	5.0	7.5
Syracuse	12.0	14.0	5.0	8.5
Boston, Mass.	10.25	12.0	4.0	7.0
Portland, Me.	11.5	13.5	5.0	7.5
Manchester, N. H.	12.1	14.1	5.0	8.0
Burlington, Vt.	12.0	14.2	5.0	9.0
Springfield, Mass.	10.75	12.8	4.0	7.5
Worcester	10.75	12.8	4.0	7.5
Hartford, Conn.	10.75	12.8	4.0	6.5
New Haven	10.75	11.5	4.0	6.0
Providence, R. I.	10.25	12.3	4.0	7.0

*Does not include 2 per cent city sales tax which is calculated on basis of net retail price exclusive of state and federal taxes. Metropolitan New York prices are undivided dealer prices; others are split dealer.

Price basis to undivided dealer: Posted dealer tank-wagon price less .5 cent. Price basis to commercial consumer: Effective Nov. 15, 1936, monthly purchases of 25,000 gallons and over, consumer tankcar prices at delivery point plus .5 cent per gallon; monthly purchases of 5,000 to 25,000 gallons, undivided dealer price at delivery point; monthly purchases under 5,000 gallons, pay divided dealer tank-wagon prices at delivery point.

Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA

	Gasoline			Kero.
	Tank-wag.	Serv. sta.	Inc. tax	tank-wag.
San Francisco	17.5	18.5	4.0	11.5
Los Angeles	17.0	18.0	4.0	10.0
Fresno, Calif.	18.5	19.5	4.0	12.5
Phoenix, Ariz.	21.5	22.5	6.0	*17.5
Reno, Nev.	20.5	21.5	5.0	13.5
Portland, Ore.	20.0	21.0	6.0	13.5
Seattle, Wash.	20.0	21.0	6.0	13.5
Spokane	23.0	24.0	6.0	16.5
Tacoma	20.0	21.0	6.0	13.5

*Includes 5-cent state tax.

Discounts to dealers: On gasoline, off tank-wagon price, to 100 per cent dealers, 3 cents; to split dealers, 2 cents. To commercial consumers: On tank-wagon price; on single deliveries of 40 gallons and over, advance quantity discount extended at time of delivery, 3 cents. Service station schedule applies on single deliveries less than 40 gallons. On kerosene in tankcar, transport truck and trailer delivery, 3 cents off tank-wagon price; plant deliveries to jobbers, 2.5 cents below tank-wagon.

Pennsylvania, Delaware, and Part of New England

ATLANTIC REFINING CO.

	Gasoline			Kero.
	Cons. tank-car	Dlr. tank-wag.	Inc. tax	tank-wag.
Philadelphia, Pa.	12.0	13.0	5.0	10.0
Pittsburgh	13.0	15.0	5.0	10.5
Allentown	12.75	14.25	5.0	10.5
Erie	13.0	14.5	5.0	10.0
Scranton	13.0	14.5	5.0	10.5
Altoona	13.0	15.0	5.0	10.5
Dover, Del.	...	13.5	5.0	10.5
Wilmington	...	12.5	5.0	9.75

Price basis to undivided dealers, dealer tank-wagon price less .5 cent per gallon. Price basis to commercial consumers in Pennsylvania and Delaware, effective March 11, 1937: Consumers under contract using 100,000 gallons or more per year full compartment hose deliveries, tankcar plus .5 cent. Consumers under contract using less than 100,000 gallons per year compartment hose deliveries, undivided dealer price. Consumers under contract less than full compartment delivery, consumers not under contract, less than full compartment delivery, and consumers not under contract full compartment delivery, divided dealer price. Less than 25 gallons, tank-wagon delivery, 4 cents per gallon above undivided dealer price.

Rocky Mountain District

CONTINENTAL OIL CO.

	Gasoline		Kero.
	Dealer	Inc. tax	tank-wag.
Denver, Colo.	15.5	5.0	11.5
Grand Junction	16.0	5.0	15.0
Pueblo	13.0	5.0	10.5
Casper, Wyo.	17.0	5.0	11.5
Cheyenne	15.0	5.0	13.0
Billings, Mont.	18.0	6.0	13.0
Butte	19.5	6.0	15.5
Great Falls	18.0	6.0	15.5
Helena	19.0	6.0	15.5
Salt Lake City, Utah	16.0	5.0	16.0
Boise, Idaho	†19.1	6.0	18.0
Twin Falls	†19.6	6.0	18.0
Albuquerque, N. M.	16.0	*6.5	10.0

*Includes city tax of .5 cent. †Includes state tax of 1 mill.

Central South District

STANDARD OIL CO. OF LOUISIANA

	Gasoline			Kero.
	Cons. tank-car	Dlr. tank-wag.	Inc. tax	tank-wag.
New Orleans, La.	16.75	19.25	*10.0	†11.0
Baton Rouge	14.75	17.25	8.0	‡10.5
Alexandria	14.75	17.25	8.0	‡12.5
Lafayette	15.00	17.50	8.0	‡12.5
Lake Charles	14.75	17.25	8.0	‡12.5
Shreveport	13.50	16.00	8.0	‡11.0
Knoxville, Tenn.	18.00	20.50	8.0	14.5
Memphis	16.00	18.50	8.0	12.5
Chattanooga	17.50	19.00	8.0	14.0
Nashville	17.00	19.50	8.0	12.0
Bristol	18.25	17.0	8.0	14.5

Essolene at dealer price less .5 cent per gallon to undivided dealers.

*Includes 2-cent parish tax. †Includes 1-cent parish tax and 1-cent state tax. ‡Includes 1-cent state tax.

Price basis to commercial consumers: Effective May 15, 1937, deliveries of 50 gallons or more in one territory take posted consumer tank-wagon price. Accounts taking deliveries of less than 50 gallons at one time pay posted consumer tank-wagon price plus 4 cents per gallon. Generally, the posted consumer tank-wagon price will be equivalent to the dealer price less .5 cent per gallon. Kerosene prices include 1-cent state tax.

Effective February 24, 1939, the company reestablished in New Orleans the commercial consumer policy on motor fuel effective in the rest of the state.

Effective December 12, 1938, the company revised its commercial consumer policy on motor fuel in New Orleans, as follows: Single deliveries of less than 50 gallons, consumer tankcar plus 2 cents per gallon; 50 to 199 gallons, consumer tankcar plus 1 cent per gallon; 200 gallons and over, consumer tankcar plus .5 cent per gallon.

Nebraska

STANDARD OIL CO. OF NEBRASKA

	Gasoline			Kero.
	Tank-wag.	Dlr.	Inc. tax	tank-wag.
Omaha	17.5	14.5	6.0	10.3
McCook	17.5	15.5	6.0	10.0
Norfolk	17.9	14.9	6.0	10.7
North Platte	18.3	15.4	6.0	11.0
Scottsbluff	17.0	14.9	6.0	11.2

Discounts to commercial consumers for tank-wagon deliveries covered only by standard commercial consumers contract, effective January 1, 1935.

Oklahoma and Arkansas

CONTINENTAL OIL CO.

	Gasoline		Kero.
	Dealer	Inc. tax	tank-wag.
Texarkana, Ark.	12.0	5.0	8.0
Fort Smith	13.25	5.0	7.5
Little Rock	16.75	7.5	8.0
Muskogee, Okla.	13.0	5.0	7.0
Oklahoma City	11.0	5.0	6.5
Tulsa	11.0	5.0	6.5

Texas

	Gasoline			Kero.
	Tank-wag.	Serv. sta.	Inc. tax	tank-wag.
Dallas, Tex.	11.0	15.0	5.0	7.0
Fort Worth	11.0	15.0	5.0	8.0
Houston	13.0	17.0	5.0	8.0
San Antonio	14.0	18.0	5.0	8.0

Naphtha

STANDARD OIL CO. (INDIANA)

	Tank-wagon*
Oleum spirits	15.7
V.M.&P. naphtha	16.0
Cleaners' naphtha	15.0
Stanisol	15.0

*Prices include 3-cent Illinois tax but not 1-cent federal tax or 2 per cent retail occupational tax.

Prices f.o.b. Chicago. Each price subject to discount of 1 cent per gallon for 150-gallon lots if covered by contract.

Canada*

3-Star Imperial Gasoline
IMPERIAL OIL, LTD.

	Tank-wag.	Inc. tax	Kero. tank-wag.
Halifax, N. S.	23.5	10.0	17.5
St. John, N. B.	23.5	10.0	17.5
Montreal, Que.	20.0	6.0	14.5
Toronto, Ont.	21.0	6.0	15.5
Hamilton, Ont.	21.0	6.0	15.5
Winnipeg, Man.	26.5	7.0	20.5
Brandon, Man.	28.0	7.0	22.9
Regina, Sask.	26.0	7.0	22.0
Saskatoon, Sask.	28.3	7.0	24.9
Edmonton, Alta.	26.5	7.0	21.5
Calgary, Alta.	23.5	7.0	19.0
Vancouver, B. C.	23.0	7.0	23.0

*Imperial gallon used in Canada.

Divided dealers pay tank-wagon prices. Discount to undivided dealers, 1 cent below tank-wagon price. In maritime provinces both divided and undivided dealers pay tank-wagon price.

Tank-Wagon Changes

Standard Oil Co. (Kentucky) March 8 reduced consumer tank-wagon and net dealer gasoline 1 cent in Atlanta and 1½ cents in Savannah; March 10, advanced consumer tank-wagon and net dealer gasoline .5 cent in Mobile.

Standard Oil Co. of New Jersey March 9 reduced tank-wagon kerosene in Baltimore 1 cent.

Continental Oil Co. March 14 advanced dealer gasoline .1 cent in Idaho; March 16, advanced dealer gasoline .5 cent in Oklahoma, except Tulsa, where advance was 1 cent; March 16, advanced tank-wagon kerosene .5 cent in Oklahoma.

Standard Oil Co. of Louisiana March 16 advanced dealer tank-wagon gasoline 1.75 cents in Bristol.

Prices of Refined Products

All quotations f.o.b. plant in cars for interstate or export movement except as otherwise noted

Prices as of March 21, 1939

The following quotations are exclusive of the federal excise taxes of 1 cent a gallon on gasoline and 4 cents a gallon on lubricating oils.

Refinery Gasoline

OKLAHOMA (Group 3)—

U. S. Motor grades:		
62 octane and below		.03⅝
63-66 octane	.04	.04⅛
67-69 octane	.04¼	.04⅜
70-72 octane (regular)	.04½	.04⅝
60-62 400 grades:		
62 octane and below		.03⅝
63-66 octane	.04	.04⅛
67-69 octane	.04¼	.04⅜
70-72 octane (regular)	.04½	.04⅝
64-66 375	.04	.04¼
68-70 360	.05	.05¼

NORTH TEXAS—

U. S. Motor grades:		
62 octane and below		.03⅝
63-66 octane	.04	.04⅛
67-69 octane	.04¼	.04⅜
70-72 octane (regular)	.04½	.04⅝
60-62 400	.03½	.03⅝
64-66 375	.04	.04¼

NORTH LOUISIANA (Ark. and N. La. delivery)—

U. S. Motor grades:		
62 octane and below	.04⅛	.04⅜
63-66 octane	.04⅜	.04⅝
67-69 octane	.04⅝	.04⅞
70-72 octane (regular)	.05	.05¼

ARKANSAS (Ark. and N. La. del.)—

U. S. Motor grades:		
62 octane and below		.04
67-69 octane	.04⅝	.04⅞

CHICAGO (Based on Group 3)—

U. S. Motor grades:		
62 octane and below	.03¾	.03⅞
63-66 octane	.04	.04⅛
67-69 octane	.04¼	.04⅜
70-72 octane	.04½	.04⅝
60-62 400 grades		
62 octane and below	.03¾	.03⅞
63-66 octane	.04	.04⅛
67-69 octane	.04¼	.04⅜
70-72 octane	.04½	.04⅝
64-66 375	.04	.04¼
68-70 360	.05	.05¼

PENNSYLVANIA (inland refineries)—

58-60 U. S. Motor:		
Below 60 octane	.04¼	.04¾
65 octane		.06¼
68-70 octane		.06½

CALIFORNIA (domestic movement)—

54-58 U. S. Motor	.06	.08
58-60 400, 65 oct. and higher	.07½	.09

EAST COAST (domestic)—

U. S. Motor, 65 and above:		
*New York (Bayonne)	.06	.06¼
Philadelphia	.06	.06¼
Baltimore	.06	.06¼
Charleston, S. C.	.06½	.06¾

*All grades of gasoline one-eighth to one-fourth cent less for barge shipments. New York Harbor prices are for New York and New England delivery. Prices for New Jersey delivery one-fourth cent lower.

GULF COAST (domestic)—

U. S. Motor grades:		
Below 60 octane		.04¼
60-64.9	.04½	.04⅝
65 octane and higher		.04⅝
68-70	.04⅞	.05⅛

Naphtha

PENNSYLVANIA (inland refineries)—

52-56 450 (blending)	.04¼	.04½

Natural Gasoline

OKLAHOMA (Group 3)—

Grade 26-70		.02½
Grade 18-55		.03

NORTH TEXAS—

Grade 26-70	.02⅜	.02½
Grade 18-55	.02¾	.02⅞

CALIFORNIA—

75-85 375-390	.06½	.07

NORTH LOUISIANA (Ark. and N. La. delivery)—

Grade 26-70		.02¾

Tractor Fuel

OKLAHOMA (Group 3)—

40-42 gr., 315-325 l.b.p., 110-flash, 540-550 e.p.	.03¾	.03⅞
41-43 gr., 300-320 l.b.p., 110-125 flash, 500-520 e.p.	.04	.04¼
46-48 gr., 210-230 l.b.p., 480-max., e.p.	.04⅜	.04⅝

Kerosene

(All kerosene water white)

OKLAHOMA (Group 3)—

41-43	.03⅞	.04
42-44	.04⅛	.04¼

NORTH TEXAS—

41-43	.04	.04⅛

NORTH LOUISIANA (Ark. and N. La. delivery)—

41-43	.04	.04⅜

ARKANSAS (Ark. and N. La. del.)—

41-43		.04½

PENNSYLVANIA (inland refineries)—

45	.05	.05½
46	.05½	.05¼
47	.05¼	.05⅜

CHICAGO (Based on Group 3)—

41-43	.03⅞	.04⅛
42-44	.04⅛	.04⅜

CALIFORNIA (Pac. Coast market)—

38-43 high burning test	.04¾	.05¾

NEW YORK (Bayonne, N. J.)—

41-43		.04½

***GULF COAST (domestic)—**

41-43	.03⅞	.04⅛

*Barge price one-eighth cent lower.

Furnace Oil

OKLAHOMA (Group 3)—

Range oil	.03⅝	.03¾
No. 1 prime white, 38-42	.03¾	.03½
No. 1 straw, 38-40		.03⅜
No. 2 straw, 32-36	.03¼	.03⅜
No. 2 dark, 32-36	.03⅛	.03¼
No. 3 zero to 15, 28-32	.03	.03¼
No. 3, 15 and above, 28-32	.02¾	.02⅞

NORTH TEXAS—

No. 1 prime white, 38-42	.03½	.03⅝
No. 1 straw, 38-40	.03⅜	.03½

NORTH LOUISIANA (Ark. and N. La. delivery)—

No. 2, 32-36	.03⅜	.03⅝

ARKANSAS (Ark. and N. La. del.)—

No. 2, 32-36		.03⅝

CHICAGO (Based on Group 3)—

Range oil	.03⅝	.03¾
No. 1 prime white, 38-40	.03½	.03⅝
No. 1 straw, 38-40	.03⅜	.03½
No. 2 straw, 32-36	.03¼	.03⅜
No. 2 dark, 32-36	.03⅛	.03¼
No. 3, zero to 15, 28-32	.03	.03⅛
No. 3, 15 and above, 28-32	.02¾	.02⅞

NEW YORK (Bayonne, N. J.)—

*No. 1	.04½	.04⅝
*No. 2		.04
*No. 4		.04

*Barge deliveries one-eighth to one-fourth cent under above tankcar price.

Gas Oil and Fuel Oil

(Gas oil per gal., fuel oil per bbl.)

OKLAHOMA (Group 3)—

U.G.I. gas oil	.02¾	.02⅞
No. 4, low pourpoint, 24-28	1.00	1.10
No. 4, 15 and above, 24-28	.85	.90
No. 5, low pourpoint, 18-22	.70	.75
Below 14 fuel oil, industrial	.45	.55

NORTH TEXAS—

U.G.I. gas oil	.02¾	.02⅞
No. 4, low pourpoint, 24-28	1.00	1.10
No. 5, low pourpoint, 18-22	.70	.75
Below 14 fuel oil, industrial	.45	.55

NORTH LOUISIANA (Ark. and N. La. delivery)—

10-14 fuel oil, industrial	.70	.75

CHICAGO (Based on Group 3)—

U.G.I. gas oil	.02⅝	.02⅞
No. 4, low pourpoint, 24-28	1.00	1.10
No. 4, 15 and above, 24-28	.85	.95
No. 5, low pourpoint, 18-22	.70	.80
No. 5, 15 and above, 18-22	.60	.70
No. 6, low pourpoint, 10-16	.60	.70
No. 6, 15 and above, 10-16	.35	.45

PENNSYLVANIA (inland refineries)—

36-40	.04½	.04¾

CALIFORNIA—

Los Angeles:		
30-40 gas oil, per bbl.	1.15	1.35
24 plus Diesel, per bbl.	1.00	1.30
24 plus Diesel (bunkers)	1.15	1.50
12-16 (bunkers at tidewater)	.75	.90
10-16 (cargo lots)	.60	.80
12-17 (tankcars)	.50	.80
10-17 (high sulfur)	.45	.70
San Joaquin Valley:		
10-18 (tankcars)	.50	.80
24 plus Diesel, per bbl.	1.15	1.40
San Francisco:		
24 plus Diesel, per bbl.	1.40	1.45
24 plus Diesel (bunkers)	1.45	1.55
10-16 (bunkers)	.90	.95

GULF COAST—

No. 2 fuel	.03⅜	.03⅝
43-47 Diesel	.03½	.03⅝
48-52 Diesel	.03½	.03⅝
53-57 Diesel	.03⅝	.03¾
Bunker C (bulk cargoes)	.67½	.70
Bunker C (bunkers)		.75

NEW YORK (Bayonne, N. J.)—

27 plus, gas oil		.04
28-30 Diesel (lighterage 6¼c per bbl.)		1.65
28-30 Diesel (tankcars)	.04¼	.04½
Bunker C (to ocean-going ships in N. Y. Harbor)		.95
Industrial fuel (tankcars)		.03¼

Lighterage charge 5c bbl. additional.

Bright and Steam Refined

OKLAHOMA (Group 3)—

190-200 D, 15-25		.19
150-160 D, 0-10	.14¼	.16
150-160 D, 15-25	.13½	.15½
150-160 E, 15-25	.13	.15
100-110 D, 0-10		.14½
Steam refined:		
631 green (treated)		.12½
600 dark green (untreated)	.04½	.05

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash):		
10 pourpoint	.17½	.19
15 pourpoint	.16½	.18
25 pourpoint	.15	.16
Steam refined:		
600	.08½	.10
650	.10½	.11
600 flash	.11	.12
630 flash	.13½	.14

Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

150-3		.09
180-3		.10
180-4		.09½
200-3		.10½
200-4		.10
250-3		.11½
250-4		.11
280-3		.12½
280-4		.12
300-6½		.13
400-3½		.14
100-2½ paraffin oil		.06
15-20 pourpoint:		
200-3		.10
200-4		.09½
250-3		.11
250-4		.10½
280-3		.12
280-4		.12½

GULF COAST—

Pale oils:		
200-3	.07	.07¼
300-3	.07½	.07⅝
500-3½	.08½	.08⅝
750-3½	.08⅝	.09¼
1 200-3½	.09½	.09¾
1,500-4	.09¾	.10
Red oils:		
200-5-6	.07¼	.07½
300-5-6	.07¼	.07½
500-5-6	.08	.08½
750	.08¾	.09
1,200-5-6	.09¼	.09½

CALIFORNIA (moving to dom. market)—

Pale oils:		
100-2½-3	.07¼	.08
200-2½-3	.07¼	.08
300-2½-3	.07¼	.08
400-3-4	.07¼	.08
450-3-4	.07¼	.08
550-3-4	.09	.11
600-3-4	.09	.11
Red oils:		
200-4-5	.07¼	.08
300-5-6	.07¼	.08
350-5-6	.09¼	.11½
400-5-6	.09¼	.11½
450-5-6	.09¼	.11½
500-5-6	.09¼	.11½
600-5-6½	.09¼	.11½
700-6½ plus	.09¼	.11½
750-6½ plus	.09¼	.11½
900-6½ plus	.09¼	.11½

PENNSYLVANIA—

150 vis. at 70° F., 3 color, 400-405 flash:		
Zero pourpoint	.17½	.18
10 pourpoint	.17	.17½
15 pourpoint	.15½	.16
25 pourpoint	.14	.14½
200 vis. at 70° F., 3 color:		
Zero pourpoint	.18½	.19½
10 pourpoint	.18	.18½
15 pourpoint	.17½	.18
25 pourpoint	.16	.16½

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—

124-126 (a.m.p.) w.c. scale	.0260	.0275

PENNSYLVANIA (inland refineries)—

122-124 (a.m.p.) w.c. scale	.0255	.0260
124-126 (a.m.p.) w.c. scale	.0260	.0265

NEW YORK—

Wax in bags fully refined:		
122-125 (a.m.p.) wax		.0350
125-127 (a.m.p.) wax		.0360
128-130 (a.m.p.) wax		.0375
130-132 (a.m.p.) wax		.0435
133-135 (a.m.p.) wax		.0465
135-137 (a.m.p.) wax		.0490
124-126 (a.m.p.) w.s.	.0255	.0260
124-126 (a.m.p.) y.s.	.0250	.0255
Petrolatum in barrels, carload lots:		
Dark green	.02	.02⅛
Amber	.02⅜	.02½
Extra amber	.02⅝	.02¾
Lily white	.05⅛	.05¼
Snow white	.06⅛	.06¼
Cream	.04⅛	.04¼

Export Prices

GASOLINE

GULF COAST—

U. S. Motor	.04¼	.04¾
60-62 400	.04¼	.04⅝
61-63 390	.04⅜	.04⅝
64-66 375	.04½	.04⅝

LOS ANGELES—

U. S. Motor grades:		
55-65 octane	.04½	.04¾
65-69 octane	.04¾	.05
Above 69 octane	.05	.05½

KEROSENE

GULF COAST—

41-43 prime white	.03⅞	.04⅛
41-43 water white	.03⅞	.04⅛

LOS ANGELES—

41-43 water white	.05	.05¼

LUBRICANTS

(Pennsylvania Grade)

NEW YORK (f.a.s. in bbls.)—

Cylinder stocks:		
600 Warren E	.15	.15½
600 S.R. unfiltered	.16	.16½
630 S.R. unfiltered	.17	.17½
600 flash, S.R.	.17	.17½
630 flash, S.R.	.20½	.21
Bright stocks:		
8 color	.16¼	.16½

NEUTRAL OIL

200-3 color	.21½	.22
150-3 color	.19½	.20

PARAFFIN WAX

NEW YORK (prices per pound)—

123-125 a.m.p.		.0375
125-127 a.m.p.		.0387
128-130 a.m.p.		.0412
133-135 a.m.p.		.0437
135-137 a.m.p.		.0455
Crude scale:		
124-126 w.s.	.0255	.0260
124-126 y.s.	.0255	.0260

Crude Oil Prices

Oklahoma, Kansas, North Central and East Central Texas

East Texas (Oct. 11, 1938)* $1.10
Van, Tex. (Oct. 11, 1938)* ..... .93
Talco, Tex. (Oct. 11, 1938)* ..... .55
Rodessa, Tex. .....
See North Louisiana gravity schedule
Cass and Panola counties, Texas .....
.....See gravity schedule
Altus and Tipton† ..... See note below
Cayuga, Tex. (Feb. 15, 1939) ..... .68
Clay Creek, Tex. ..... .85

*Humble Oil & Refining Co. †Gulf Refining Co. Pure Oil Co.'s Van price, 93 cents, effective Oct. 13, 1938.

Altus and Tipton, Okla., starting at below 25 degrees at 71 cents, 2-cent spread to 40 degrees and above at $1.03. East Texas price met by all buyers posting prices. Talco price adopted by Talco Pipe Line on October 11. Cayuga posted by Pan American Pipe Line Co. Clay Creek posted by Sun Oil Co.

Southwest Texas

Salt Flat, Darst Creek, Hilbig, Carroll, Clark and Zoboroski (Oct. 11, 1938)* ..... $ .96
Pettus (Oct. 11, 1938)* 1.29
Flour Bluff (Dec. 3, 1938)* 1.23
Darst Creek (Oct. 12, 1938)† ..... .96
Darst Creek and Bruner (Oct. 13, 1938)‡ ..... .96
Luling (Oct. 12, 1938)† ..... .87
Lytton Springs (Oct. 12, 1938)† ..... .99
Mirando (Oct. 12, 1938)† .....
Government Wells (Oct. 13, 1938) .....
.....See note below

*Humble Oil & Refining Co. †Magnolia Petroleum Co. Pettus price adopted by Atlantic Crude Oil Purchasing Co. ‡Gulf Refining Co.

Government Wells posted by Sun Oil Co. starts at 20 gravity, 77 cents, 3-cent spread to 24-24.9 at 89 cents.

Gulf Coast

Conroe, Tex. (Oct. 11, 1938)* $1.27
Black Bayou and White Castle, La. (Oct. 11, 1938)† ..... See note below
Gibson, La. (Oct. 11, 1938)† 1.04
Garden Island, La. (Oct. 12, 1938‡ 1.24
Lafitte, La. (Oct. 12, 1938)‡ 1.04
Cleveland, Tex. (Oct. 12, 1938)¶ 1.14
Hardin, Tex. (Oct. 12, 1938)¶ 1.02
Tepetate, La. (Oct. 11, 1938§ 1.03
Villa Platte, La. (Oct. 11, 1938)§ 1.03
Abbeville, La. (Jan. 1, 1939)§ .....
.....See note below
Bosco, La. (Dec. 3, 1938)¶ ..... .93
Creole, La. (Oct. 13, 1938)¶ ..... .96
Gueydan, Sweet Lake, and Louise, La. (Oct. 13, 1938)¶ ..... See note below
Vinton, Edgerly, Starks, Hackberry, Timbalier Bay, Quarantine Bay, and Grand Bay, La. (Oct. 13, 1938)** .....
Long Lake, Tex. (Oct. 13, 1938** 1.08
Segno and Wing (Oct. 13, 1938)** .....
.....See note below
Livingston (Oct. 11, 1938)† 1.10
Gibson, La. (Oct. 11, 1938)† 1.04

*Humble Oil & Refining Co. †Shell Petroleum Corp. ‡Texas Co. §Continental Oil Co. ¶Magnolia Petroleum Co. ‖Pure Oil Co. **Gulf Refining Co.

Black Bayou, etc., starts at below 20 degrees at 79 cents; 20-20.9, 81 cents; 21-21.9, 83 cents, then a 3-cent spread to 26-26.9 degrees, 98 cents, and 27 degrees and over $1. Abbeville starts at below 36 degrees, 92 cents, 2-cent spread to 40 degrees and over at $1.02. Gueydan, etc., starts at below 20 degrees, 79 cents, 3-cent spread to 26-26.9 degrees at $1, and 2-cent spread to 40 degrees and over at $1.28. Segno and Wing take Gulf Refining Co.'s Gulf Coast prices. Vinton, Edgerly, etc., schedule starts at below 18 gravity, 76 cents, 2-cent spread to 20-20.9 at 82 cents; then a 3-cent spread to 26-26.9 at $1; then a 2-cent spread to 34 degrees and over at $1.16.

North Louisiana and Arkansas

Shreveport, La. (Mar. 11, 1939) ..$1.00
Shreveport, La. (Mar. 13, 1939) ..$8
Smackover, Ark. (Oct. 5, 1938)* .... $ .73
Buckner, Magnolia, and Village, Ark. (Oct. 5, 1938)* ....See note below
Schuler, Jones sand .....See note below
Tullos and Urania ..... .89
Cotton Valley, La. (distillate) (Dec. 23, 1938)* 1.20
Lisbon, La. (Sept. 19, 1938) .....
.....See note below

*Smackover posted by Standard Oil Co. of Louisiana, October 5, 1938; by Magnolia Petroleum Co., October 12; by Gulf Refining Co., October 13; McMillan Refining Co. and Cross Refining Co. met price. Tullos and Urania posted by Hunt Oil Co. and Arkansas Fuel Oil Co.

Schuler Jones sand schedule starts at below 25 degrees, 66 cents, with 2-cent spread to 40 and over at 98 cents; by Lion Oil Refining Co. on October 5, 1938; Schuler light Morgan sand crude takes North Louisiana gravity scale along with El Dorado and Champagnolle; by Lion Oil Refining Co., October 5; Buckner, Magnolia, and Village schedules posted by Standard Oil Co. of Louisiana and Lion Oil Refining Co. on October 5; quote same prices as for Schuler Jones sand crude. Shreveport: $1 price by Caddo Crude Oil Purchasing Co.; 98-cent price by Atlas Oil Corp.

Middle Western States

OHIO OIL CO.
(Effective October 13, 1938)

Lima, Ohio ..... $ .90
Illinois old fields 1.05
Illinois basin 1.15
Princeton, Ind. 1.05
Western Kentucky (Oct. 13, 1938)† 1.10
Greendale, Porter, and Crystal, Mich. (Jan. 6, 1939)* ..... .92½
Buckeye, Bentley, Edenville, Beaverton, Mich. (Jan. 6, 1939)* ..... .90
Freeman-Redding, Mich. (Jan. 6, 1939)* ..... .82
West Branch and Arenac, Mich. (Dec. 13, 1938)* ..... .70
**Allegan-Kent (Mar. 15) ..... .68
Bloomingdale (Dec. 19) ..... .84
Muskegon 1.00
Sherman, Mich. (Dec. 13, 1938)‡ ... .82
Eastern Kentucky:
Big Sandy River† 1.12
Kentucky River† 1.20

*Simrall Corp. †Ashland Refining Co. ‡Pure Transportation Co. **Commonwealth Pipe Line Co.

Rocky Mountain States

Dry Creek, Wyo. (Oct. 11, 1938)* $ .92
Elk Basin, Wyo. (Oct. 11, 1938)*† .90
Grass Creek, light, Wyo. (Oct. 11, 1938)*† ..... .90
Grass Creek, heavy (Oct. 11, 1938)† .40
Lance Creek, Wyo. Oct. 11, 1938)* .77
Rock Creek, Wyo. (Oct. 11, 1938)* 1.00
Iles, light, Colo. (Oct. 11, 1938)† ... .98
Iles, heavy, Colo. (Oct. 11, 1938)† .92
Dutton Creek, Wyo. (Oct. 11, 1938)† .....
.....See note below
Frannie, light, Wyo. (Oct. 11, 1938)† .55
Frannie, heavy, Wyo. (Oct. 11, 1938)† ..... .42
Hamilton dome, Wyo. Oct. 11, 1938)† ..... .35
Midway, Wyo. (Oct. 11, 1938)† .....
.....See note below
Salt Creek Tensleep crude, Wyo. (Oct. 11, 1938)† ..... .646
Salt Creek (Oct. 11, 1938) See note below
Canon City, Colo. (Oct. 11, 1938)‡ .90
Florence, Colo. (Oct. 11, 1938)‡ .90
Cat Creek, Mont. (Oct. 11, 1938)‡ .. 1.10
Big Muddy, Wyo. (Oct. 11, 1938)‡ .98
Lance Creek, Wyo. (Oct. 11, 1938)‡ .77
Lea County, N. M. .....
.....See West Texas gravity schedule‡
Artesia, Jackson and Maljamar .....
.....See gravity table‡
Fort Collins and Wellington, Colo. .....
.....See gravity table‡
Eddy County, N. M. (October 11, 1938)¶ ..... .77

*Ohio Oil Co. †Stanolind Oil & Gas Co. ‡Continental Oil Co. ¶Sinclair Prairie Oil Marketing Co.

Dutton Creek and Salt Creek Tensleep crude start at below 29 degrees, 86 cents, 2 cents spread to 40 and over at $1.10. Salt Creek crude excepting Tensleep takes Standard Oil Co. of Indiana, Oklahoma-Kansas prices. Stanolind Oil & Gas Co., effective October 11, discontinued posting prices in Greybull-Torchlight, Wyo., and Hogback and Hospah, N. M.

Eastern States

SOUTH PENN OIL CO.
(Effective March 6, 1939)

Pennsylvania Grade Oil in National Transit Lines (Bradford field) $2.00
Pennsylvania Grade Oil in Southwest Pennsylvania Lines 1.65
Pennsylvania Grade Oil in Eureka Pipe Line lines 1.59
Pennsylvania Grade Oil in Buckeye Pipe Line lines 1.55
Corning Grade Oil in Buckeye Pipe Line Co. line (Jan. 24) 1.02

TIDE WATER ASSOCIATED OIL CO. and NEW YORK TRANSIT CO.
(Effective March 6, 1939)

Bradford, Pa. $2.00
Allegany, N. Y. 2.00

PENNZOIL CO.
(Effective March 6, 1939)

Group A $1.95
Group B 1.94
Group C 1.93
Group D 1.92
Group E 1.90

PURE OIL CO.
(Effective March 6, 1939)

West Virginia $1.59

West Texas

See gravity table.
Pecos County (Oct. 11, 1938)* .... $ .78
Pecos shallow (Oct. 11, 1938)† .... .65

*Shell Petroleum Corp., Gulf Pipe Line Co. and Humble Oil & Refining Co. †Shell Petroleum Corp.

Canada

Ontario (Oct. 25, 1938)*

Petrolia $1.90
Oil Springs 1.97

TURNER VALLEY
(January 5, 1938, by Imperial Oil, Ltd.)

Clear naphtha and discolored naphtha, 65 gravity and higher $2.14
Discolored naphtha and crude oil, 40-40.9 gravity 1.14
Increasing 2 cents for each degree gravity with top price for 64-64.9 gravity 1.62
These prices f.o.b. producers' field tankage.

*Imperial Oil, Ltd.

Crude Oil Price Changes

Commonwealth Pipe Line Co., effective March 15, posted a price of 68 cents per barrel for crude gathered in the Allegan and Kent fields in Michigan.

New York Market

(Continued from Page 151)

few spot barge deliveries. An unconfirmed rumor gained circulation last week that a few barge lots of 65-octane motor fuel were offered in the New York harbor territory at 5½ cents. Suppliers reported making deliveries at the lower figure denied that business had been accepted at this rate and that their minimum was 5¾ cents. The tankcar markets at Philadelphia, Baltimore and Boston were unchanged from the preceding week and in general are on a parity with the price range in New York.

Lubricating oils continue in a strong position in western Pennsylvania with low pour test, viscous, neutral oils leading the movement to higher ground.

Says Superhighways Promotion Scheme

Thomas J. Keefe, general manager of the American Motorists Association, hit the proposal made at the annual meeting of the American Road Builders Association in San Francisco for a 1-cent increase in the federal gasoline tax to finance a $1,000,000,000 superhighway system in the United States.

He termed the superhighway proposal, "a sales promotion plan," designed to benefit highway contractors and the manufacturers of road materials at the expense of the nation's motorists. According to plans announced by the road builders, Congress will be petitioned to enact enabling legislation at its present session.

"Apparently the perennial dream of the road builders for a superhighway is being de-mothed and renovated again," Mr. Keefe said. "For the past five years, there has been constant promotional activity designed to sell superhighways to the American public, but the public has failed to be deluded by the promoter's dreams. Last year, the plan called for a coast-to-coast toll highway, and the only difference this year is that the superhighway would be financed by doubling the present federal gasoline tax."

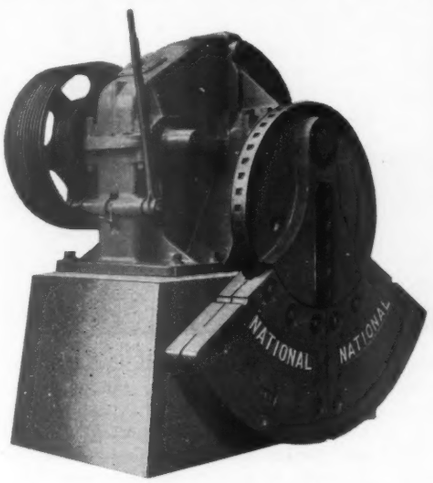
Crude Prices by Gravities

	1 Oklahoma	2 Oklahoma and Kansas	3 North and Central Texas	4 Louisiana and Arkansas	5 East Central Texas	6 Gray County, Texas	7 Hutchinson and Carson counties, Texas	8 Raccoon Bend, Satsuma and Tomball, Texas	9 West Texas and Lea County, N. M.	10 Fort Collins and Wellington, Colo.	11 Anahuac and Dickinson, Mirando, Duval, Texas.	12 Refugio, Texas	13 Gulf Coast Texas	14 Cass and Panola counties, Texas	15 Beaumont and West Beaumont, Texas	16 Lockport, Iowa, Cameron Meadows, Louisiana	17 Artesia, Jackson and Maljamar, N. M.	18 Iowa, Louisiana
Below 18	....	....	....	....	....	....	....	....	$.53	....	$.74	$.79	$.79	....	....	$.74	....	$.75
18-18.9	....	....	....	....	....	....	....	....	.53	....	.74	.79	.79	....	$.79	.78	....	.77
19-19.9	....	....	....	....	....	....	....	....	.55	....	.77	.82	.82	....	.82	.80	....	.79
20-20.9	$.60	$.70	....	....	....	....	....	....	.57	....	.80	.85	.85	....	.85	.82	....	.81
21-21.9	.63	.72	....	....	....	....	....	....	.59	....	.83	.88	.88	....	.88	.85	....	.83
22-22.9	.66	.74	....	....	....	....	....	$.95	.59	....	.83	.88	.88	....	.88	.85	....	.86
23-23.9	.69	.76	....	....	$.78	....	....	.97	.61	....	.86	.91	.91	....	.91	.88	....	.89
24-24.9	.72	.78	$.71	....	.80	....	....	.99	.63	....	.89	.94	.94	....	.94	.91	....	.92
Below 25	....	....	....	$.73	....	....	....	....	....	....	....	....	....	$.73	....	....	....	....
25-25.9	.75	.80	.73	.75	.82	....	....	1.01	.65	....	.92	.97	.97	.75	.97	.94	....	.95
26-26.9	.78	.82	.75	.77	.84	....	....	1.03	.67	....	.95	1.00	1.00	.77	1.00	.97	....	.98
27-27.9	.81	.84	.77	.79	.86	....	....	1.05	.69	....	.97	1.02	1.02	.79	1.02	.99	....	1.00
28-28.9	.84	.86	.79	.81	.88	$.72	$.67	1.07	.71	$.81	.99	1.04	1.04	.81	1.04	1.01	$.61	1.02
29-29.9	.87	.88	.81	.83	.90	.74	.69	1.09	.73	.83	1.01	1.06	1.06	.83	1.06	1.03	.63	1.04
Below 30	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
30-30.9	.90	.90	.83	.85	.92	.76	.71	1.11	.75	.85	1.03	1.08	1.08	.85	1.08	1.05	.65	1.06
31-31.9	.92	.92	.85	.87	.94	.78	.73	1.13	.77	.87	1.05	1.10	1.10	.87	1.10	1.07	.67	1.08
32-32.9	.94	.94	.87	.89	.96	.80	.75	1.15	.79	.89	1.07	1.12	1.12	.89	1.12	1.09	.69	1.10
33-33.9	.96	.96	.89	.91	.98	.82	.77	1.17	.81	.91	1.09	1.14	1.14	.91	1.14	1.11	.71	1.12
34-34.9	.98	.98	.91	.93	1.00	.84	.79	1.19	.83	.93	1.11	1.16	1.16	.93	1.16	1.13	.73	1.14
Below 35	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
35-35.9	1.00	1.00	.93	.95	1.02	.86	.81	1.21	.85	.95	1.13	1.18	1.18	.95	1.18	....	.75	....
36-36.9	1.02	1.02	.95	.97	1.04	.88	.83	1.23	.87	.97	1.15	1.20	1.20	.97	1.20	....	.77	....
37-37.9	1.04	1.04	.97	.99	1.06	.90	.85	1.25	.89	.99	1.17	1.22	1.22	.99	1.22	....	.79	....
38-38.9	1.06	1.06	.99	1.01	1.08	.92	.87	1.27	.91	1.01	1.19	1.24	1.24	1.01	1.24	....	.81	....
39-39.9	1.08	1.08	1.01	1.03	1.10	.94	.89	1.29	.93	1.03	1.21	1.26	1.26	1.03	1.26	....	.83	....
40 and over	1.10	1.10	1.03	1.05	1.12	.96	.91	1.31	.95	1.05	1.23	1.28	1.28	1.05	1.28	....	.85	....

New or Improved Equipment

National Reduction Gears Suit Many Types of Installations

National Type H reduction gears for oil-field pumping, described in a bulletin just issued by the National Supply Co., may be used in at least



five principal types of installations. The most common of these are two-, three-, and four-well hook-ups; beam-and-post assemblies; and single-well pumpers. The efficiency of these installations is increased by the use of National eccentric and concentric disc cranks and counterweights. On both of these types counterweight adjustment is by power, and there is no manual handling or weight-lifting. The weights slide around an endless circular track and are adjusted to any position desired, allowing a great degree of accuracy in counterweighting effect and degree of lag and lead.

National Type H reduction gears are made in a complete range of sizes, covering both single- and double-reduction types. A.P.I. peak torque ratings at 20 s.p.m. range from 48,800 to 345,000 inch-pounds. Maximum polished-rod strokes are from 36 to 72 inches. Considerable selection in counterweight effect has been provided. Complete information concerning these gears is given in Bulletin 222, which describes sizes and types, as well as construction and design. Field applications illustrate the all-around utility of these gears.

Bulletins, Booklets, and Other Literature for the Trade

"The Core Puller" is the title of an interesting article in the current number of the Yellow Strand, published by Broderick & Bascom Rope Co., St. Louis, Mo.

Proportioneers, Inc., Providence, R. I., is mailing on request a 20-page booklet describing the company's products for metering, controlling and proportioning.

The Guffey "45" portable drilling rig is the subject of an eight-page bulletin sent on request by Jones-Shelburne, Inc., Oklahoma City, Okla.

"Filtrol Products and Their Commercial Uses" is a 32-page illustrated, spiral-bound bulletin just published by the Filtrol Corp., 315 West Fifth Street, Los Angeles, Calif. Engineers and chemists engaged in the refining of petroleum oils or the processing of animal and vegetable oils will find this bulletin of value.

An attractively illustrated booklet of 32 pages is obtainable from the Independent Exploration Co., Houston, Tex., describing seismograph exploration in the search for oil and pointing the way to the drill. Besides presenting the background, personnel, service and equipment of the company, the booklet explains interestingly the principles involved in seismograph work.

A booklet, "New and Better Fittings for Small Welded Lines," has been issued by Crane Co., 836 South Michigan Avenue, Chicago, to introduce a new product, the uses of which are presented with photographs and drawings. Tables show the hydrostatic bursting pressures, tensile pull tests and working pressures.

Technical Bulletin T-15, "Engineering Properties of Nickel," is offered by the development and research division of the International Nickel Co., Inc., 67 Wall Street, New York.

The Hill, Hubbell & Co. division of the General Paint Corp., Cleveland, Ohio, is mailing on request a bulletin on its process of coating and wrapping steel pipe.

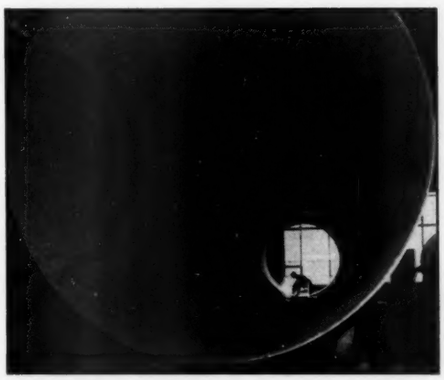
An eight-page bulletin offered by Crosby Steam Gage & Valve Co., Boston, Mass., describes and illustrates the new Crosby pressure recorder.

A new catalog, describing the Raybould coupling for steel pipe, is being distributed by Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

Caterpillar Tractor Co., Peoria, Ill., is mailing on application a bulletin on the R2 tractor, which has five forward speeds.

Arc-Welder Seems Dwarfed in Shell of Big Flash Chamber

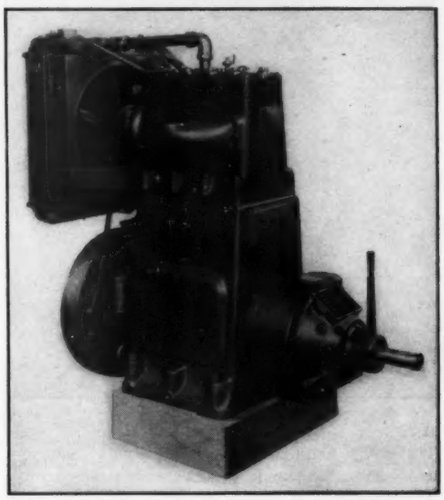
The arc-welder, in the accompanying picture, is dwarfed inside the tunnel-like shell of a flash chamber for oil refining being built in the A. O.



Smith Corp.'s Milwaukee, Wis., plant for foreign shipment. The chamber is Smithlined throughout with spot-weld chromium alloy steel sheets with the patented Smith construction. The shell is 80 feet long and 9 feet in diameter.

Pumping Engine for Oil Field Is Offered by Cooper-Bessemer

The Cooper-Bessemer Corp. has announced an addition to its line, the Type G-SC vertical pumping engine. Designed primarily for oil-field pump-



ing and drilling service, this engine is also fully adapted to auxiliary and light power needs. Though light in weight, it is built to heavy-engine standards. It is shipped as a completely assembled unit, with radiator and fan as standard equipment.

The G-SC engine is rated 25 to 35 horsepower at speeds of 600 to 800 r.p.m. It is a two-cylinder, two-cycle unit, with bore of 5½ inches and stroke of 7 inches. Its overall height is 4 feet 1¾ inches, overall width 2 feet 6 inches, and overall length with clutch 5 feet. The minimum quantity of concrete required for its foundation is given as 1 cubic yard. Starting may be effected either by hand or compressed air. Meehanite metal, known for its strength and resistance to wear, is used for all cast parts.

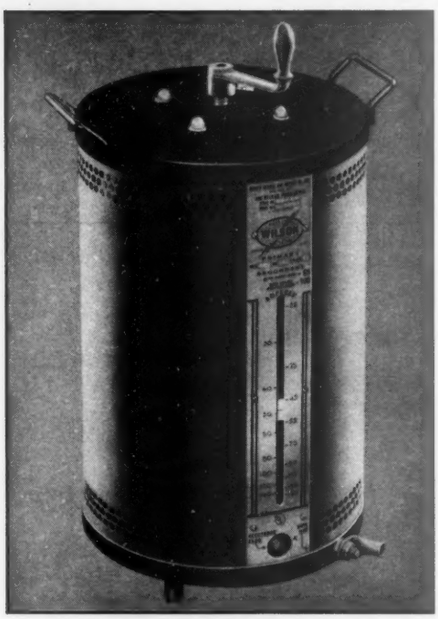
The vertical design and low overall dimensions of the Type G-SC reduce foundation and housing costs to a minimum and these features, together with its light weight, make it an easily transported and installed unit. Among features are low foundation and housing costs, extreme portability, long-life construction and design, magneto ignition, full-pressure lubrication, clutch or straight pulley drive, slow-speed reliability, tapered roller main bearings, and low maintenance costs. This new Type G-SC unit will be displayed at the Houston oil show, April 24 to 29.

Modernizing Milwaukee Works

A program of rehabilitation, rearrangement, and modernization of the Milwaukee works of the International Harvester Co., extending over an 18-month period, is announced by E. J. Leiser, superintendent. The company will expend approximately $3,000,000 in the work. The new program includes a complete rehabilitation of the foundry so as to equip it for specialization in the manufacture of large castings. It also includes the laying out of required factory space preparatory to the manufacture of two new sizes of Diesel engines for the Harvester line. The program does not include any new factory building construction.

Wilson Welder Is Designed for Work Requiring Low Current

Wilson Welder & Metals Co., Inc., New York, announces a new arc welder of 100-ampere rating



at 30 volts for light sheet-metal welding and other light work requiring low current and fine control. The machine is of the alternating-current, transformer type, and designed especially for use with heavily coated electrodes. Standard wiring is for single-phase, 220-volt, 60-cycle power supply, but it can be furnished for 440-volt supply if desired. Open-circuit voltage is 65 volts.

A calibrated scale on the front of this welder indicates the adjustment throughout the range of the machine, which is from 25 to 150 amperes. This adjustment is made continuously by rotating a crank at the top, and as the circuit is not broken there is no need to stop operations and open any connections while a change is being made. The continuous nature of the adjustment makes it possible to tune the current exactly to suit the thickness and welding characteristics of the material being welded and of the electrode used.

Alternating-current welders of this size have been found to give the best performance when electrodes made especially for that type of welding are used, and the company recommends Wilson No. 520 with this model. It will accommodate diameters up to 5/32-inch. Enclosed in a sheet-metal housing 16½ inches in diameter and 24 inches high, weighing 145 pounds, the new welder is a compact and mobile unit, designed to afford safety and durability.

Here and There With Men Who Manufacture Equipment

Sid Bertram and Dan Elam, engineers formerly operating out of the Los Angeles headquarters of International Geophysics, Inc., have been transferred to Lovington, N. M. Expansion of the company's continuous profiling and echometer operations includes new and improved field equipment and a larger force for the Permian basin area. New branch offices have been established at Great Bend, Kans., and Kilgore, Tex.

National Radiator Corp. has appointed Eastern Steam Specialty Co., Inc., 125 Barclay Street, New York, its representative in that area, and Faville-LeVally Corp., 140 South Dearborn Street, Chicago, its representative in the Chicago district.

Laminated Shim Co., Inc., Long Island City, N. Y., has just celebrated its twenty-fifth anniversary. President C. N. Aborn and Louis R. Tiemann, in charge of plant and tool maintenance, have been with the company continuously since its founding in 1913.

I. Frank Brown, New York, export representative for several oil equipment manufacturers, has returned to his eastern office after spending two and a half months in Colombia, Trinidad, and Venezuela and two months in California, Oklahoma, and Texas.

Appointment of Tom W. Moss as director of Dodge truck sales to succeed J. D. Burke, resigned, is announced by Forest H. Akers, vice president and director of sales of the Dodge Division of Chrysler Corp.

For Low-Temperature Applications

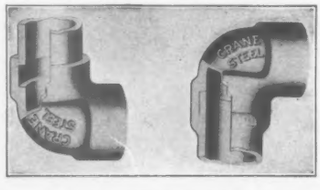
The Wheelco industrial indicating control thermometer, Series 4200, announced by Wheelco Instruments Co., 1929 South Halsted Street, Chisago, is designed to be used for low-temperature control applications. Any scale desired up to 1,000° F. may be had. The instrument makes use of a bulb and capillary to actuate a bourdon tube assembly.

This thermometer controller operates on the same "no-contact" electronic principle standard in the Wheelco Capacitrol indicating pyrometer controller. Being entirely electrical in construction and having no moving parts to wear or interfere with the accuracy of control, it affords instantaneous reaction to the slightest temperature variation. Bulletin 4201 gives detailed information.

Two Important Features Mark Crane Co. Welding Fitting

Two features mark the forged-steel socket welding fitting introduced by Crane Co., 836 South Michigan Avenue, Chicago. One is the deep socket which provides liberal come and go in the assembling of pipe. On installations where the pipe need not butt against the shoulder at the back of the socket it is unnecessary for the welder to cut the pipe to accurate length or even to cut it off square. On installations where the pipe must butt against the shoulder, free uninterrupted flow can be assured conveniently.

The second important feature is the fact that these fittings are designed especially for welding. They are not made from ordinary screwed fitting blanks, but are especially designed with neat-



appearing bands only slightly larger than the pipe. The socket wall is especially proportioned for welding, assuring uniform heat distribution and proper heat penetration.

"While given high pressure and high temperature ratings," says the Crane Co. announcement, "these fittings are also expected to be used in installations operating at much lower pressures and temperatures, replacing ordinary cast-iron and malleable screwed fittings where welding has been chosen as the preferred method of assembly."

Blade Backfiller Effects Saving of Time in Pipelaying Work

The Allsteel Products Manufacturing Co., Wichita, Kans., announces its Blade backfiller, which can be mounted on Caterpillar Model R-5 gasoline or D-6 Diesel wide-gauge tractor with Cardwell Allsteel Model PG sideboom. There is no con-

flict between the mounting and the operating mechanisms. This development eliminates the necessity of removing the blade for pipelaying or the sideboom when backfilling trench.

The operator has clear vision ahead and to the sides. The blade is hydraulically operated by a single lever control placed near the operator's seat. The lift of the blade is approximately 1 foot per second, a total of 28 inches above track and 8 inches below. The blade can be locked in any position.

The moldboard is reinforced by ribs and a large box beam across the entire bottom of the blade, so placed that it takes the heaviest strains. The push-bars are of large H-beam section, strong but not heavy. The Blade backfiller can be mounted on the tractors mentioned now in the field and equipped with Cardwell Model PG sideboom.

Rifle Bullet or Flames Will Not Detonate New Blasting Agent

A new blasting agent, Nitramon S, for seismic prospecting by the reflection method has been announced by E. I. du Pont de Nemours & Co. It is packed in metal cans, with ends which permit joining of a number of separate units before loading in the blast or shot holes.

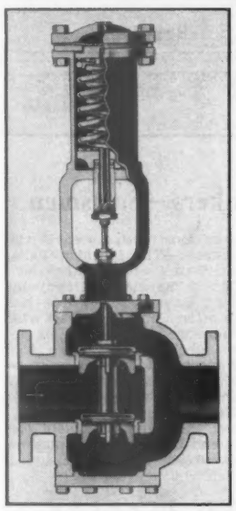
"The blasting agent is much safer to handle and use than gelatin dynamites normally used for reflection shooting," the company's announcement says. "It is not an explosive in the accepted sense, since it cannot be detonated by the strongest commercial detonators, by Cordeau or Primacord detonating fuse, by flame, or by heavy blows, which is particularly important for the safety of field crews. Even the impact of a rifle bullet will not detonate the charge.

"As the separate cans may be joined together to form a single unit column of any desired weight, Nitramon S is easier to handle than ordinary gelatin. As long as the sealed cans remain intact, the blasting agent retains its maximum blasting efficiency under water. Since it is packed in sealed cans, handling becomes a clean operation, with no contact with any of the contents. The new blasting agent is nonfreezing under any temperatures."

The strength and velocity of the agent are said to be approximately equal to those of gelatins employed in geophysical prospecting.

Excessive Steam-Pressure Fall Avoided by Fisher Governor

The Fisher Governor Co., Marshalltown, Iowa, has added a new high-pressure multiple spring-actuated governor, Type 516, to its line of automatic controllers.



This new governor, especially suitable for controlling high discharge pressures of steam-driven pumps, is designed with an extra-heavy diaphragm assembly and nested springs, adapting it for use where the ordinary diaphragm governor is not suitable and where a piston-type governor is not desired. It is for: (1) High discharge pressures on oil or other liquids which have a tendency to leak by piston-cups, and (2) for installation on piston-actuated governors, where discharge pressure is too high for standard diaphragm assemblies.

Among outstanding features is the reversible body with large valve ports. This feature eliminates excessive steam pressure drop. Its double-ported inner valve is not affected by fluctuating steam pressures. The diaphragm surfaces are virtually rupture proof. Diaphragms of special oil-resistant composition can also be furnished.

Other features include the large ball-bearing adjusting screw, which permits easy changing of discharge pressure setting even at high pressures, and inner valves connected to the valve stem by a patented "Flexaline" connection, to insure positive seating without binding or friction.

Sizes in this unit range from 1 to 3 inches, with screwed ends, and 1 to 4 inches with standard flanged ends. Available in either angle- or globe-pattern bodies. Valve bodies are of high-tensile iron, bronze or electric cast steel. Inner parts are Duromite bronze, nickel iron or stainless steel. Catalog B contains full information.

Rolls Out Collapsed Casing and Liners to Their Right Shape

A new casing roller, designed to roll out collapsed or rough casing and liners to their proper size and shape has been introduced by the Eastman Oil Well Survey Co. The Eastman casing roller has a specially heat-treated steel body with rollers and balls inserted on the outer surface. The body is made in three parts. The rollers are held in place by the body, which encircles about two-thirds of the rollers' circumference. The special steel rollers and balls are so arranged that they give a maximum of rolling surface as well as minimizing vibration and friction on the body. The tool is blunt on the bottom so that it will not puncture the collapsed casing. Sizes range from 3⅛ to 17⅞ inches in diameter.

Eastman general offices are in Dallas, Tex., with offices in Houston, Oklahoma City, Long Beach and Bakersfield.

New 200-Horsepower Diesel Is Put on Market by Murphy

The Murphy Diesel Co., Ltd., of Milwaukee, Wis., announces a new 200-horsepower Diesel engine, the ME-650. The design conforms to that of the standard Murphy Diesel Model ME. Injection is direct into a plain symmetrical combustion chamber. Injector and fuel pump are in one unit, which is easily removed and replaced. There are no high-pressure fuel lines, and injectors cannot become air-bound.

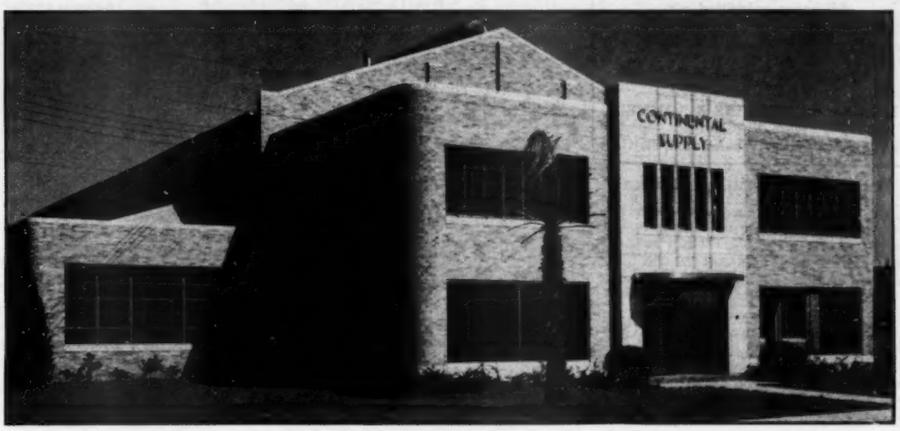
Special care has been taken to assure cool operation, and pistons are oil-cooled under pressure to eliminate ring troubles and need for special lubricating oils.

Four valves are provided for each cylinder to assure maximum breathing capacity and rapid scavenging. Should the oil pressure drop below a fixed minimum pressure, the engine automatically shuts itself off. Control is through a single lever which permits easy and simple toggling-in for remote control. Starting is accomplished with a standard 24-volt starter. All parts are easily accessible.

The ME-650 can be had either as a bare engine or with radiator and full enclosure. Skids, outboard bearings, and direct-connected generator units are also available.

CONTINENTAL OPENS COASTAL HOME

Located on the route of the old Spanish trail leading from Houston, Tex., to new oil fields in Louisiana and Arkansas, the opening of the new Continental Supply Co. office and warehouse building at 6015 Navigation Boulevard, Houston, on Thursday, March 23, marks an important expansion in that company's activity on the Gulf Coast. The new unit includes a pipe yard fronting on the Houston Ship Channel, allowing direct loading from barges to yard.



Trimmed in Texas limestone, the new building is modern in appearance and appointments. It consists of two divisions, the offices, including showrooms, and the warehouse proper. Office space and showrooms occupy 3,600 square feet of floor space and are air-conditioned. Rubber tile provides a quiet floor covering for the offices, while Azrock tile floors are used in the showrooms. Stainless steel gives a modern setting to the foyer and venetian blinds are used throughout.

Visitors will be free to inspect machinery housed in the new warehouse. All equipment will be stored inside the building, making it unnecessary for customers to visit a muddy yard during inclement weather. The warehouse proper has a main bay 60 feet wide by 360 feet long, over all of which is a 25-ton push-button control floor operated traveling crane. Two side bays, 25 feet wide each and 140 feet long, adjoin each side of the office portion. A railroad spur permits the unloading of two cars without switching. Truck-high loading-ramps facilitate loading and unloading of trucks. A unique feature is the use of blue glass to kill direct glare.

Twenty cars of pipe may be loaded daily from the pipe yard, using the new 25-ton locomotive crane. Trucks may be loaded with equal facility. The entire yard is floodlighted at night, making possible 24-hour service and insuring prompt filling of last-minute orders. Approximately 12,000 tons of tubular products are kept on hand at all times.

Incoming pipe moves from the mill of Continental's parent company, the Youngstown Sheet & Tube Co., at Youngstown, Ohio, to Baden, Pa. It is floated by barge down the Ohio River to Cairo, Ill.; thence on the Mississippi River to New Orleans, and coastwise to Houston and the Ship Channel. The average trip requires three to four weeks.

Continental's improved facilities in Houston will offer an added service to the industry, insuring ample stocks of machinery, pipe, and supplies for the Gulf Coast.

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PATENT LAWYER
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Leases and Drilling Blocks

LEASES—East Texas, La., South Ark. 20 acres up, dollar acre up.—Owners—Address Attorney, Box 1122, Little Rock, Ark.

DRILLING deals wanted 50,000 acres Southern Illinois in and around production area. Elmer Gant, Anna, Illinois.

ILLINOIS 60.000 acres in and near production. Illinois Minerals Company, Cairo, Illinois.

SACRIFICE 40-acre Oil Lease, Chaves County, for only $10.00, full price. Guarantee title. P. O. Box 191, Clovis, N. Mex.

320 ACRES, Crane Co., Tex., Magnolia lease, cheap in fee. Address 415 Littlefield Building, Austin, Texas.

5 ACRE Mineral Deed, Landowners Royalty under entire 80 acres of land leased to Gulf Oil Co. being N½ NW¼ Sec. 30, Twp. 14s, Rge. 31e, full price only $32.50. Perpetual and full participating. Send your check. Guarantee delivery. P. O. Box 968, Hobbs, New Mexico.

HOT SPOT LEASES
Forest City Basin, North Missouri. Get them while cheap, some close to wells $1.50 acre, up. Box 152, Milan, Mo.

I HAVE several good blocks of leases located on good structure in Kentucky, all leases regular 10 yr. with 25c rental after first year, will give necessary acreage for test well, drilling cost around Three Thousand dollars complete also have acreage near drilling wells for sale at $1.00 to $10.00 per acre. Box 612, Owensboro, Ky.

NEW 10 yr. lease sec. 11 6n 3w McClain Co. Okla. favorable geology. Joe P. Crawford, fee owner, Oklahoma City, Okla.

3000 ACRES Illinois leases. Give drilling contract for small bonus. L. L. Livingston, 5057 Enright, St. Louis, Missouri.

INVESTORS investigate quickly—chance for hundred for one near drill by independent who owns thousands acres Texas land, and recently purchased thousands royalty acres. References. Box 54, Marshall, Texas.

ILLINOIS acreage in Boone County, Illinois, near Belvidere. Driller wanted on acreage basis. JOHN BOYD, Belvidere, Illinois.

HAVE 40 acres not leased, ¾ Mi. west and south of the M. O. Cavalin tract on which is located Sun Co.'s #1 M. O. Cavalin in the west Palacios or buttermilk slough area, Gulf Coast, Texas. This is the N.E. 40 of 240 acre T. J. McAvan Estate, balance being leased to The Sun Oil Co. Want a drilling proposition and will consider sale of part of royalties on adjoining acreage if desired. B. J. Wesselman, Salisbury, Mo.

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NOW AVAILABLE—4700 acres on eight structures in the shallow Kentucky-Tennessee field and on which D. B. Malernee, Geo. Key, Ben F. Davis, et al, of Oklahoma City hold large acreage. N. M. Sauls, Geologist, Byrdstown, Tenn.

Leases and Drilling Blocks

WILL give ⅜ interest for $18,000 to drill deep test on 1000 acres, 1½ miles S. W. of good well, ruined by inexperienced drillers and lack of capital at 1,481 ft. 20 ft. saturation. Illinois basin. Get details. Wm. H. Rennscheidt, 1814 E. "B" St,. Belleville, Illinois.

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State Oil and Gas Leases
STOP FUMBLING. Buy on known structures where major companies own leases. 50c per acre. 5c rentals. Other leases as low as $6.00 per forty. Write for list. Twenty years in the business without a complaint.
HARRY S. WRIGHT, STATE LESSEE
Registered Dealer—State of Iowa
Box 166, Council Bluffs, Iowa
Box 347, Santa Fe, New Mexico.

SEE Frank Boykin, Girard, Louisiana, for drilling block or blocks in heart of Richland Parish big gas field.

FOREST City Basin, Kans. & Mo. Leases, 40 acre tracts and drilling blocks. Margaret Haynes, R. #3, N. Topeka, Kansas.

LEASE for sale, one well, forty acres. Offset to well which has been producing since 1923. Re-pressuring on two sides. Needs shooting and cleaning out. Will sell for about what the equipment is worth. Don't write, come and look it over if interested. Laurence Price, Coweta, Okla.

FOR SALE Oil and gas leases on structure, leases joining production, ten-year term wildcat leases with low rentals, and producing leases all located in Kentucky shallow oil field. W. P. HARLEY, Bowling Green, Ky.

Oil Industry Printing

OIL FIELD LEGAL BLANKS
Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

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1939 EDITION MAP OF TEXAS
and Eastern New Mexico shows all OIL and GAS FIELDS up to date
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Fair Bldg. Fort Worth, Tex.

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MAP BOOK of all Texas counties 254 maps, each 14x16 inches. Show: Sections, blocks, surveys, certificate and abstract numbers. With Binder. Postpaid $10.00.
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KINGWOOD OIL COMPANY'S 10% Cumulative $10 par Preferred stock, with $6.66 back dividends now due, offer a real opportunity to share large profits from its Illinois production and extensive operations. For quick sale we can deliver 3,000 shares at $9.60 per share. Wire. GLOBE SECURITIES CO., LTD., OKLAHOMA CITY, OKLA.

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The Philtower
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Brokers—Salesmen

Sell in the most active area in the United States—The Permian Basin of West Texas and Southeastern New Mexico. From the standpoint of royalty investors this area has much to offer. Can supply you with choice non-producing royalties located on geophysical highs. Also drilling blocks, close in acreage to production, or wildcat leases. I maintain my own field men who cover this area for me. All offerings meet the requirements of the Security and Exchange Commission. Inquiries invited.

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Paul Brown Bldg., St. Louis, Mo.

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OIL ROYALTIES
Registered Dealers Only.
GRIMES ROYALTY CO.
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PRODUCING OIL ROYALTIES
15 years of experience.
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OWNERS of fractional landowners royalty interests still paying send full details to City Investing Co., 434 Roosevelt Bldg., Los Angeles, Calif.

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PRODUCING ROYALTIES. Big individual investor can arrange with Okla. City man to buy distressed producing royalties under partly dev. leases at big saving. Write Box J-913, The Oil and Gas Journal, Tulsa, Okla.

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OIL FINDING DOWSING METHOD
My deductions a practical method which picks up vibratory reactions emanating from carbo-hydrates. Physico method finds oil, locates faults. Same method discovered great East Texas field also our Watson #2 first producer Wilmington, Calif. field. Employ a man that owns producing wells. I find oil if it exists or no charge. George Miller, 1548 Post, Torrance, California.

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SINCE 1908 Burkhart's legal forms—serving Mid-Cont. oil fields, including Ill., La. Mo. Ind. & Ky. Free catalog & samples. Burkhart Ptg. & Sta. Co., 115 So. Cinn., Tulsa, Okla.

Mailing Lists

ROYALTY Lists, Unit Owners Lists. Stockholders Lists. By states. Oil Industry Mailing List Co., Tulsa Loan Bldg., Tulsa Oklahoma.

3,500 up-to-date producing royalty owners names and addresses Oklahoma. 800 East Texas. 850 Registered oil and gas dealers. Revised. 1 cent per name. $10 minimum order. OIL INFORMATION SERVICE, P.O. Box 601, Tulsa, Oklahoma.

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Classified advertising rates: First insertion, 35 cents a line; each additional insertion, 25 cents a line, PAYABLE IN ADVANCE. Six words usually make a line. Count as a word each one-letter word and each group of figures. White-space computed at regular line rate. Allow two extra lines for blind ads. Ads of less than three lines not accepted. No formal acknowledgement is made, and proofs cannot be shown in advance of publication.

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We reserve the right to withhold all advertising of questionable character. To avoid delay be sure to send remittance with copy. We will set your ad in the smallest amount of space possible and refund all overpayments. One-time insertions will not be run until fully paid. Forms close MONDAY NOON before each issue date.

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

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Vessels-Towers-Condensers-Heat Exchangers-Boilers-Pumps-Valves-Fittings-
Complete Stock All Other Items
Line Pipe 2"-2½"-4"-6"
Priced for Immediate Sale.

Send us your inquiries for storage tanks, any size.
Will quote tank erected your grade any location.

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Robt. W. Duden,
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25 K.W. and 40 K.W. Gas Engines, 220 volts, D.C. Two 100 K.W. Gas Engine-Generator Sets, 220 volts, D.C. 7x6 Ingersoll-Rand ER-1 Air compressor. Six-inch Oster Pipe Threading Machine. Also large stock of lathes, pipe machines, milling machines, etc. Send for our list.
Terms to suit.
CINCINNATI MACHINERY & SUPPLY CO.
26 West 2nd St. Cincinnati, Ohio.

FOR SALE: At Oklahoma City No. 4A National Tank Oil and Gas Separators 500# working pressure. I. T. I. O. Co., Bartlesville, Oklahoma.

FOR SALE
3,000 barrel Cracking Unit located in Oklahoma. This unit is in good condition and could be converted to a combination skimming and cracking unit to handle 6,000 barrels of crude daily by the addition of pumps, towers and exchangers. Box 2009, Tulsa, Oklahoma.

FOR SALE: Sectional Steel Buildings 1—30 x 10 x 60 standing; 1—20 x 8 x 128 K. D. Oklahoma City; 1—24 x 8 x 106 K. D. Seminole, condition O.K. Inspection invited. I. T. I. O. Co., Bartlesville, Okla.

WILSON GIANT PORTABLE DRILLING RIG; Powered by Buda Diesel Engines. Rig is complete and in A-1 condition. Terms. P. O. Box 1360, Seminole, Okla.

FOR SALE: 1 Bruning Drafting Machine complete, slightly used, purchased in 1938. Address: 2821 First National Bldg., Oklahoma City, Oklahoma.

FOR SALE: 2—OCS chain driven reconditioned sand reels, I. T. I. O. Company, Bartlesville, Oklahoma.

FOR SALE: One 6 cylinder Climax Motor, 125 Horsepower, and one Franklin Clutch, both in A-1 condition. Address Garth McMillen, Coldwater, Kansas.

FOR SALE: Used large capacity positive and orifice gas meters. Geo. R. Milner, Okmulgee, Oklahoma.

FOR SALE 45 Star Spudder Complete with tools and equipment, 13 inch down to 6⅝ inch. Also 60 Caterpillar tractor J. L. Gardenhire, Centralia, Illinois.

1938 Failing Core Drill complete, Ford mounted. Cost $12,000. Price $6,800. M. E. Neiswanger, Box 662, Brownwood, Texas.

ENGINE—Factory Reconditioned Weber Horizontal Bronze Bearing OIL Engine. 15" Bore by 15" Stroke, rated 60 H. P. Engine equipped with special wide-face flywheels to accommodate 12" wide flat belt. Particularly adapted for driving electric generator. Weber Engine Company, Kansas City, Mo.

FOR SALE—Steel riveted smoke stack. Self supporting. Diameter 9 feet, heigh' 126 feet. Like new. Can ship on day's notice.

High and low pressure refinery valves Standard makes. Sizes ¾ inch to and including six inch. Subject to test inspection. Harvey Bros., 706 Rudd, Canon City, Colorado.

FOR SALE
1—6' x 52' Jenkins Bubble Tower.
1—5' x 30' Jenkins Reflux Tower.
1—10' x 14' Jenkins Clay Tower.
1—1000 bbl. Power Specialty Co. Pipe Still.
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Wichita, Kansas.

FOR SALE: Model K04, 150 H.P. Cummins Diesel Drilling Engine less than one-half price. This unit about one year old.—General Machine & Supply Company. Wichita Falls, Texas.

2—BUDA heavy duty 6 cyl. Power Units, with radiator, fan, etc. Model JH-6, 6x7¼". 80 to 155 HP. Operate on Gas, Gasoline, Butane, or 38/40 Distillate. Completely overhauled. Immediate shipment from stock. Make excellent drilling rigs.
MISSISSIPPI VALLEY EQUIPMENT CO.,
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Diesels 25 to 1200 HP For Sale and Wanted

FOR SALE CHEAP: Two Southwestern Distillation Units; Tanks; Steel Buildings; High Pressure and Low Pressure Absorbers. Globe Gasoline Co., Blackwell, Okla.

ENGINE—Factory Reconditioned Weber Horizontal Bronze Bearing GAS Engine. 14" Bore by 14" Stroke, rated 50 H.P. Right-hand flywheel sheave type especially for driving electric generator. Weber Engine Company, Kansas City, Mo.

FOR SALE: CIW steam operated, McEvoy hand operated blowout preventers high pressure steel drilling and manifold gate valves, cable tools, oil and gas separators, butane tanks, well servicing units. I. T. I. O. Co., Bartlesville, Okla.

Equipment Wanted

WANTED: Spudder, with or without tools, suitable for 2000 feet; also well servicing winch for same depth. R. B. Somerville, Box 47, Mt. Pleasant, Mich.

RECORDING Pressure gauges wanted. State price, specifications and quantity. UNITED DEVELOPMENT CO., Chatham, Ontario, Canada.

Situations Wanted

REFINERY Engineer thoroughly experienced maintenance, construction all types modern refinery units. Executive background. Technically trained. Consider any location, any reasonable offer. Address Box J-905, The Oil and Gas Journal, Tulsa, Okla.

SUPERINTENDENT or plant engineer small oil refinery. Graduate Civil Engineer Texas A. & M. College. Seven years' experience—two large oil refineries. One year construction big job in steel mills. Address Box J-922, The Oil and Gas Journal, Tulsa, Okla.

REFINERY Operator and Chemist desires location. Experience in still operation, cracking, lube mfg., treating, etc Management experience. Address Box J-852, The Oil and Gas Journal, Tulsa, Oklahoma.

Situations Wanted

GRADUATE PETROLEUM ENGINEER—14 years' experience in production and geological work. Several years in supervisory capacities. Supervision of drilling and development a specialty. Desire connection with reliable firm. References if needed. Address Box J-882, The Oil and Gas Journal, Tulsa, Oklahoma.

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BUSINESS MANAGER

Financial executive with accounting and legal training and experience as Comptroller, General Auditor, Secretary and Treasurer, and Director in large corporations handling office management and supervision of all divisions of related work including accounting, credit management, purchasing, personnel, etc., in general office and many field offices. Now employed in Southwest. Age 37, married and have family. Higher education in Accounting, Business Management, and Law.

Salary expected commensurate with responsibilities of position.

Address Box J-920, The Oil and Gas Journal, Tulsa, Okla.

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HELP WANTED—MALE
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SUPERINTENDENT of construction and maintenance desired by small but complete petroleum refinery in central state. Must have experience in erecting new constructions and repairing and inspecting modern refinery equipment. Address Box J-921, The Oil and Gas Journal, Tulsa, Okla.

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WAREHOUSE SPACE FOR RENT

1,000 square feet warehouse space with office accommodation, dock facilities on Frisco trackage, Tulsa, Oklahoma.

1,000 square feet warehouse space with office accommodation, dock facilities—centrally located, Great Bend, Kansas.

Attendant on duty 24 hrs.—both locations.

Phone 4-0369 or apply at 41 So. Elwood, Tulsa, Okla.

LARKIN PACKER COMPANY

RELATION

(Continued from Page 45)

lant or a deterrent to the inflow of new capital and at times the refining capacity, relative to requirements, is such that there is little need for new capital. Likewise, there is nothing abnormal in the fact that the prices of refined products, being more sensitive, should reflect changes in the supply-demand situation for the industry as a whole more promptly than do crude oil prices. On the other hand there appears, in recent years, to have been an abnormal degree of postponement in the response of crude oil prices to adverse changes in the supply-demand picture for the industry as a whole and this tendency has operated to the serious disadvantage of the refining branch of the industry. Some authorities question whether it would not be sounder for the industry as a whole if there were a closer correspondence between the movements of crude oil and refined product prices. Certainly it must be admitted that if we are to have a free-enterprise industry, declines as well as improvements in the market prices of our industry's products and its raw material must take place from time to time.

Of course, the crude oil price cannot indefinitely remain unresponsive to changes in the market value of its products, a fact which was borne out in 1938 when, approximately a year after the decline in refined product prices began, there was a general decline in crude oil prices. If independent refining is to survive as a separate activity along with independent production and marketing, however, there must be a reasonably prompt response in the raw material prices to fundamental changes in petroleum supply and demand and the time lag on the down side must not be too greatly in excess of the lag on the up side when refined prices are rising. It is understandable, of course, that crude oil producers do not like to see crude oil prices decline any more than refiners like to see product prices decline. In a time when excesses are accumulating, however, whether they be in actual above-ground stocks, the discovery of new reserves, or the drilling of new wells or other increases in production capacity, some reduction in price may be one of the necessary corrective factors before a genuine improvement can ensue, and it may well be that more prompt changes in smaller amounts might be salutary. The industry has achieved, in the last several years, a greater stability in the general range of crude oil prices which seems entirely healthy but, at the same time, the time lag on the down side has been increasing. It is quite possible, as Mr. Byles, president of the American Petroleum Institute, suggested in his address at Houston, Tex., in 1934, that a small reduction in the price made promptly would avert the necessity of a much greater change later when the pressure of oversupply or overcapacity had been unduly aggravated by the delay. There is always the fear on the part of producers, of course, that once a decline sets in it will lead to ruinous levels. Barring special situations such as East Texas in 1931, however, and especially under today's proration conditions, this fear hardly seems justified by the facts. It is perhaps significant to note that within a few months after the recent decline in the crude price, an improvement in refined product prices has commenced.

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